MASON HAIRE

MODERN ORGANIZATION THEORY

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Modern Organization Theory

Modern

A Symposium of the Foundation

One of a series of books from the research program of the
Institute of Industrial Relations, University of California

Organization Theory

for Research on Human Behavior

Edited by

MASON HAIRE

NEW YORK · JOHN WILEY & SONS, INC.

LONDON, SYDNEY

University of Florida
1853

FOURTH PRINTING, JANUARY, 1965

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Library of Congress Catalog Card Number: 59-13426
Printed in the United States of America

Preface

The papers in this book were first read at a symposium held by the Foundation for Research on Human Behavior at Ann Arbor, Michigan, in February, 1959. The authors would like to express their thanks to the Foundation for making the meeting possible. The chairman of the meeting was Dr. Samuel Hayes, Director of the Foundation. Professor Douglas McGregor, of the Massachusetts Institute of Technology, and Hollis W. Peter, of the Foundation, took part in the discussion. Following the discussion at Ann Arbor, Professor Dorwin Cartwright, who also participated in the meeting, agreed to prepare a brief statement on graph theory. The analysis of linkage-systems in an organization occurs so often that it is of special relevance. His paper is designed to provide a brief introduction to the concepts and a bibliographical aid to the interested student. It is the only one of the papers which was not available to the participants before the meeting.

In addition to the academic participants, a group of representatives of interested industries took part: Arthur W. Brown, Manager, Employee Relations, Standard Oil Company (New Jersey); Andrew T. Court, Business Research Staff, General Motors Corporation; Hugh

Estes, Consultant, Organization Principles and Criteria Development, General Electric Company; Edwin R. Henry, Advisor, Employee Relations Department, Standard Oil Company (New Jersey); Robert Hood, President, Ansul Chemical Company; S. F. Leahy, Vice-President, Detroit Edison Company; Lewis E. Lloyd, Economist, Dow Chemical Company; O. A. Ohmann, Manager, Employee Relations Department, Standard Oil Company (Ohio); H. J. Phillips, Vice-President, U. S. Steel Company; Wayne P. Strong, Administrative Assistant to President, Ansul Chemical Company; Charles C. Upshall, Industrial Psychologist, Eastman Kodak Company; and Richard Wadell, Assistant Manager, *Business Week.*

In order to make these papers available promptly, they are presented here as they were written. This means that, in many instances, one paper is not responsive to relevant points which may have been raised in another, since they were written simultaneously. Similarly, no attempt is made to represent in detail the interactions that went on in discussing the various points of view. The selection of emphases in the introductory statement, the pointing to common threads and unresolved issues, is the Editor's responsibility. The author's burden is only the way in which he has presented his point of view in the individual chapters.

The Editor is particularly indebted to the Foundation for Research on Human Behavior, both for the support which it has given to his research which is reported in this volume and to the organization of the symposium and the production of this collection of papers. Finally, Mrs. Paul Seabury, of the Institute of Industrial Relations at the University of California, deserves special commendation for her painstaking efforts with the detailed editorial problems involved in bringing together a set of papers written by so many different authors.

Berkeley, California
September, 1959

MASON HAIRE
Editor

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BOOKS BY M. HAIRE—

Modern Organization Theory

Organization Theory in Industrial Practice

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MASON HAIRE

1.

Introduction—Recurrent Themes and General Issues in Organization Theory

ORGANIZATION THEORY HAS DEVELOPED TREMENDOUSLY RAPIDLY IN recent years. Even ten years ago, it would not have been possible to bring together such a group of papers. Had we discussed organization then—the term "organization theory" itself would have seemed out of place—the content would have been radically different. An earlier presentation might have dealt with the role of the line and staff, with the functions of the executive, with span of control, and perhaps with a touch of theory of the firm from classical economics. Not only would the discussion have centered on relatively specific problems in industrial organizations, but the concepts themselves would have been grounded in and closely related to the activities of the business.

Today the situation is quite different. A whole group of conceptual developments bear on the problem of industrial organization. Game theory and decision theory, information theory and communication theory, group theory, and developments in motivational theory can all be focused on the central topic. Beyond the specific conceptual approaches, the growing tendency toward the making of models and a quasi-mathematical approach have radically changed the field. Indeed, the problem of organization is a rare thing in the social sciences. It is the natural focus of several disciplines. Here we can gain the leverage of a variety of theoretical concepts, each linked to broad and broadly different conceptual frameworks in the disciplines from which they spring.

In this situation we can expect—and we find—not only different approaches to the problem, but different views of what the problem is. In some instances one aspect is emphasized over others; sometimes quite different values seem to be maximized. In still others, the approach shifts from inductive, naturalistic field observation to the more rarefied deduction from a relatively abstract model. In this diversity of approach and of theoretical backgrounds there are present power and vigor and future promise of fruitfulness toward a comprehensive statement of organization theory. This is the justification for presenting, in this fashion, a group of papers which are the ragged leading edge of a wave of theoretical development and which bear only the common imprint of a focus on the organization of productive human groups. The aim of each of them has been to present the most recent thinking on the subject in each of the diverse approaches.

One of the first things one notices in reading these chapters on organization is the parallel with the fable of the blind man describing an elephant. There is little doubt here that it is a single elephant being discussed, but, by and large, each of the observers begins his description from a different point, and often with a special end in view. Each of the authors is dealing with organizations and how they work; but, to some extent, they start from different bases and have different things in mind which need explaining.

As the reader goes on, for example, he will find Argyris starting with assumptions about the motivation of human beings, the way these motives develop, and their eventual conflict with the demands of an organization of several individuals. The problem becomes, "How can units of this sort best be linked together?" Whyte, on the other hand, begins with a descriptive model of the organization based on the interaction, activities, and sentiments of the members. He goes on to argue that such a model is fruitful in the analysis of the behavior of people in organizations. Bakke begins with a definition of the concept of a social organization, stressing its special character, activities, resources, and integration. He, too, aims at an analysis of organizational behavior, but particularly those processes holding individual and organization together, the barriers to effectiveness, and factors lethal to the organization. Dubin focuses on sources of instability—both individual and organizational—in behavior systems, and aims at realistic strategies, based on the correction of instabilities, maximizing the maintenance of the group as a functioning unit.

In a somewhat different view, Likert starts with human motives as Argyris did, but concentrates on the failure of the organization to use present knowledge of motives-in-action. He goes on to illustrate a modified theory of management and organization to utilize motives toward productive efficiency. Haire starts with the observed growth of organizations and organizational parts, aiming at the discovery of lawful processes in growth, particularly stressing the internal and external pressures leading to the interdependence of size, shape, and function.

Marschak, Rapoport, and Cyert and March all start with the decision process, though in very different ways. Marschak shows decision requirements shaping the organization. Cyert and March's, and Rapoport's approach both treat it more as a dependent variable flowing from such things as goals of individuals and sub-groups, task forms, organizational structures, and the like. Both in Cyert and March and in Marschak the survival value of organizations is taken as a criterion. Marschak and Rapoport stress the optimizing of performance measured by external criteria, while for Cyert and March, though a certain level of performance is essential, optima are measured more in terms of satisfying the demands of the coalition-members.

Such diversity should not be surprising, nor should it be thought of as the whim of the various authors. The area examined *is* diverse as an object of social scientific study. In an older-fashioned study of organizations, for example, one might have asked the relatively simple question, "What is the maximum number of people supervised that will still leave maximum control with the supervisor?" The independent variable is simply numbers of people and the dependent, total control. When the field is broadened, as it is here, more facets appear. On the side of the independent variable, there seem to be at least three distinguishable starting points: (1) one may begin with the relatively pure structure of organization—linkage for reporting, responsibility, etc., degree of centralization, hierarchical levels, and the like; (2) at the other extreme, if one concentrates on behavior in organizations, he starts with an analysis of motive, activities, and interaction; (3) finally, midway between the two, one may start with the interaction between the two—the conflict between the demands of the individual personality and the organization. Next, there are a group of factors which seem properly to be intervening variables, mediating the influence of the first group, although in specific analysis they may be treated as independent and, to some degree, causal. In this group would be such things as the decision process, the communication processes, specific tasks of the organization, and the like. The dependent variables seem to fall under two heads, broadly considered: (1) the continual existence of the group; and (2) its productive efficiency. The first of these is perhaps particularly relevant to the corporation, a legal entity whose indefinite existence is one of its defining characteristics. However, it is clear that many more solutions can be found to lead to productive efficiency in a short-term organization if continuous existence can be disregarded. On the other hand, "productive efficiency" as a criterion must be broadly considered, with the term "efficiency" covering a wide variety of costs, and "productive" implying a set of by-products for the members as well as the simple goals of the organization.

With this complex chain of determinants, it is not surprising that a group of social scientists represent a variety of different approaches in making up the problem. It seems likely that the same central lines which appear here will continue to bear the focus of theory and research in this field for some time, as a variety of values are determined and fitted to each of the variables. It may be useful to the reader to identify some of the recurring issues. Placed in this introductory position, they will lack the detailed support of the context in which they appear. Perhaps it would be better to return to them after having read the individual papers. The attempt to identify issues, thus, may serve both as introduction and summary. It should be pointed out again that the identification of common threads or recurrent themes, and the attendant emphases, is the Editor's responsibility. The authors do not necessarily agree with what he reads in their writings.

The Conflict between Personality and Organization

It is impossible to deal with the problem of organization without soon encountering the conflict between the individual's needs and the organization's demands. Whenever we join a group we give up some individual freedom—concerning what will be done, the way it will be done, and the rate at which it will be done. Membership in a group presumably provides returns which are unavailable to the member alone. Otherwise he would leave the group. The calculus of the balance between these two is a pervasive problem. It is central to the question of the cohesiveness of groups. It invades the problem of group structure and organization planning. It underlies managerial policies from plans for expansion to wage payment plans. Incidentally, it should not be thought that this calculus involves a conscious reckoning on the part of the member of an organization. It is inferred from behavior.

Argyris has made this conflict the sharp issue of other writings. It recurs in this paper here. On the one hand, there are the motives of individuals; on the other, the demands of the organization. This conflict is countered by the informal organization in an attempt on the part of individuals to salvage their own directions—to beat the system, as it were. This move, in turn, is met by the administrative response to informal activities. Argyris gives some of the details of a "healthy solution" in a particular case.

The same issue appears, in other terms, in Bakke's paper, and he meets it largely with one of the "bonds of organization"—the Fusion Process. Haire points to essentially the same problem when he speaks of the centrifugal force in organizations—the tendency for individuals, because they are individuals, to fly off from the central mass on paths of their own. He uses the phenomenon somewhat differently from the other two. He assumes the organization will grow to protect itself where forces tending to destroy it are strongest. Consequently the growth of certain parts is seen as a response to this threat to the organization's continued survival.

Dubin deals with the matter. His second main line in dealing with stability focuses on the "group processes by which working associates present a united front to the organization." Even in the relative formalism of Cyert and March's decision-based approach to the formulation of organizational objectives, the problem of side payments in coalition-formation becomes important. These side payments are, in a sense, the price in return for which the individual adopts the organization's goal.

Conflict between individual and organizational demands is omnipresent. Often, in current writings about organization theory, there seems to be an implicit assumption that it is inevitably deleterious. Certainly some conflict—between personalities and between individuals and the framework—are harmful and expensive, but others seem to be fruitful, stimulating, and productive of growth. If they were absolutely eliminated, the organization, relaxing in a bovine acceptance of its pattern on the part of the members, would have no protection from its own mistakes and no hope from a "divine spark of discontent." In the experimental case on which Rapoport reports, there was a high degree of task-orientation among the members which not only led to a tolerance for conflict, but also made it seem that conflict was useful and perhaps even supportive. The student of organizations should perhaps take special care to avoid an automatic negative reaction to the existence of this conflict. It is the very variety of human motives, skills, and interests which protects the organization from over-rigidity as it meets rapidly changing situations.

Another caution for the student of organization appears in this connection in one of the cases illustrated here. Argyris shows a situation in which there is, in a sense, a "healthy" organization with "sick" foremen. Here there was high morale and productivity, but a feeling on the part of hourly paid workers of job-security, control over their own work, and lack of involvement in it. This situation led to a passive role for the foreman and consequent dissatisfaction in top management, who centralized decision, undercutting the foremen still more. It was a productive situation but one in which the particular adjustmental solution of finding need-satisfaction for the workers had clear-cut organizational implications—centralization of authority and impoverishment of the foreman's job. This particular solution to the competing demands is one possible dynamic balance—and, apparently, one that works. However, it is an equilibrium under high tension, and one that is liable to be upset by any one of a variety of incidents or changes. In such a situation almost anything can trigger a major explosion. Frequently we may be misled by mistaking the trigger for a cause. The necessary cause is grounded in the unstable equilibrium in the organization itself and we must learn to recognize it there.

Structure of Organizations

The problem of structure in a relatively pure sense—of linkages, levels, and bonds—is another recurring theme. Marschak asks what structure will optimize decision in certain circumstances. Haire observes structure directly and hypothesizes concerning forces playing on it. Rapoport provides a situation in which it is possible to study both structures and process as variables. In doing so he raises a fundamental point about the linkage of individuals for communication in problem-solving groups.

He points out that in dealing with communication among linked individuals we have tended to use the information theory of "bits" developed for telecommunication engineering. Such a formulation is useful for determining channel capacity (and may, as Haire suggests, have implications for the growth of the staff as a channel), but it is not maximally useful for studying decision-making in groups. Here one needs a model of the cognitive aspects of communication theory —a way to indicate the potential of bits for reducing uncertainty about a real state of affairs. Such an approach contrasts with the definition of information in terms of the probabilities of selecting a certain class of messages from a source with given statistical characteristics. Information theory treats of the transmission of symbols regardless of referents; a more semantic communication theory deals with referents and largely bypasses the problem of transmission.

This shift from "bits" to "bits of meaning" has real implication for the student of processes in working groups. Now it becomes important *which* "bit" is lost; redundance is not as crucial, and is not necessarily equally weighted among messages. Accumulated information, *a priori* knowledge, and readiness to respond assume different values. In a sense, the problem reappears in Whyte's analysis of interaction. If interaction-analysis is limited to observing and counting interaction, it is parallel to the symbol transmission problem of telecommunication-type information theory. Whyte goes on to ask that purpose, influence, and the consequences of interaction be included in the observation. The simple "who talks to whom?" observation has been useful in determining certain aspects of organizational structure. The expanded analysis—parallel to a semantic information theory—would take interaction well into behavior processes in organizations.

Dubin also spends a good deal of time on information linkages in organizations. In treating stabilities in structures, the linkage system is one of two basic classes of factors he treats. Cartwright's presentation of a sketch of the application of graph theory to these problems adds greatly both to the elegance and generality of the treatment. In a problem so central to organization structure as linkages, the power of a relatively well-worked-out model for analysis seems considerable.

Dubin argues that minimizing the number of links among units promotes the stability of an organization. It is interesting, at this point, to look at Likert's paper on motivation and productivity. Here it is argued that maximum participation and interaction—maximum linkage in this sense—lead to high morale and hence to productivity. The structure of the organization cannot be analyzed only with communication—or even decision—as a criterion. Again, Dubin points out that some situations tend to be characterized by equivocation and indeterminacy in authority; so that radial or serial linkage-systems are inappropriate. It is in this circumstance that the coalition processes dealt with by Cyert and March flourish. The structure of organization for communication is inextricably bound up in all the other organizational processes.

As it is presently stated, a linkage approach seems to need further specification. It is not clear just what a link implies. It is usually dealt with in terms of communication, but also implies other organizational processes like some of Bakke's "Bonds," and as Dubin suggests—work-flow; power, authority, and status relations; promotion ladders; and functional dependencies holding the organizational division of labor together.

If the nature of organization links is made specific, it does not always seem clear that Dubin's theorem of minimizing the number of links in a system is inevitably the most efficient solution to organization problems. Indeed he points out that: coordination of subordinate units may lead to a preference for a circular (a non-minimum linkage) system; and that where there is equivocation of authority or status assignment, a circular system may also be preferred. Dubin's general proposal of minimum links among organization units must be confronted by Likert's conclusion that important organization purposes are served by maximizing links between individuals representing adjacent organization levels. The efficiency of the organization as a system seems to vary with the type of analytical problem, and the definition of organization efficiency—e.g., speed, correctness, morale.

Bakke, too, deals with organization structure, though neither in the linkage terms just dealt with, nor focusing on quite the skeletal detail that Haire does. In a more conceptual sense, the Bonds of Organization become elements of structure. From this approach, for example, he would point out that the problem of modifying foremen, which Likert raises, is an organizational problem. In Bakke's terms, the attempt to make employee-centered leaders is a directional process, and the difficulty comes when the change lacks support from the context of other perpetuating processes in the situation. These variables are the fabric of the organization in Bakke's terms.

Between these two extremes—on the one hand the empirical detail of Haire, Dubin, and Cartwright's linkage maps, or Rapoport's and Marschak's structures for decision, and, on the other, the sweeping conceptual breadth of Bakke—there is quite a gap. Research needs explicit coordinating definitions to tie the generality of, for example, Control Bonds, to the observable specificity of particular organization structure.

Decision Theory

The most outstanding fact about decision theory in these papers is the way it splits into two quite different approaches to the problem of organization. For Rapoport, and Cyert and March, for instance, the decision process is a dependent variable, flowing from other factors which can be manipulated or observed. Marschak, on the other hand, treats the decision process as an independent variable. Organizational survival is the ultimate criterion (cost in terms of the probability of attaining organizational goals is the proximate criterion). The shape of the organization—for instance, its decentralization—becomes the dependent variable.

In both examples the decision process has a central role, but the analyses are quite different. In one, problem-solving decisions or objective setting depend on factors such as specific tasks, individual demands, or organization structure; in the other, the organization is tailored to make decisions in such a way that the residue of average gross payoff less organizational cost is as great as possible. Needless to say, this shift in focus leads the attention of the research worker to quite different points.

Cyert and March also suggest some modifications in classical game theory as it applies to the setting of organizational goals. The principle of conservation of utility seems to them to be inapplicable; the total value of side payments in coalition may depend on the composition of the coalition and total utility on the particular distribution. Similarly, they suggest that it is not always possible in coalitions to deal with a joint preference-ordering with differences resolved through bargained side payments. Instead of the allocation within the group of a fixed, divisible booty, they suggest that the process of setting objectives is in itself a provision of payments in the form of policy commitments. Although this view leaves some of the already developed mathematical power of traditional game theory, it seems to fit better with the realities of organizational life.

The approaches represented both by Marschak and by Cyert and March provide orderings in terms of the relative desirability of various solutions. It is not necessarily true, either in motivational terms or in the social processes of group structure, that this is the same as an ordering in terms of avoiding relatively undesirable alternatives. Often behavior seems to vary quickly from one of these systems to the other, and it would seem useful to direct attention to the implications of each and to the conditions under which each occurs.

The Ecology of Organizations

It seems clear that one of the factors influencing the organization of an industrial enterprise is its relation to the economic context in which it is imbedded. Traditional economic studies of industrial organization or theories of the firm generally devote more attention to this area than is true here. These papers tend to recognize a broader ecological context, and to treat the problem as somewhat tangential to organization theory.

Whyte, for instance, in his diagrammatic representation of the determinants of organizational behavior, provides a broad environmental context for the operation of other factors. He specifies economic, legal, social, and technical characteristics of the environment. It is a kind of a background on which the work group appears as a figure. In his discussion he deals at some length with the impact of the environment.

Marschak's initial matrix of action and communication provides explicitly for action both on and from the world outside the organization. In his analysis of the efficacy of forms for decision, it is the success or failure of the firm in the competitive environment which provides the criterion. Haire, somewhat similarly, analyzes the growth of organizations using equations derived from processes in living organisms. He stresses the fact that the constants in these equations are determined, in living organisms, by the nutritive character of the environment. By implication, the characteristics of the economic environment of the firm will determine parameters associated with the growth curve of the organization.

Bakke deals with contact with the environment in still another way, though the economic competitive context is not explicitly treated. He speaks of a set of homeostatic activities which preserve the organization in an evolving state of dynamic equilibrium. Among these is what he calls the Leadership Process. This function anticipates the impact of environmental pressures which are beyond the organization's power to control, and provides adaptive modifications throughout the organization. In a sense, the process is similar to the cognitive adjustmental process hypothesized in individuals which protects the organism by minimizing surprise in contact with the environment.

Each of these approaches represents some form of explicit acknowledgment of the play of environmental forces on the firm. Each of the others, at least in so far as they deal with either the firm's profit or the individual's social nature, implicitly deals with the influence of contact outside the organization. None of them, however, deals with a set of specific economic variables which it would seem necessary to include in an eventual comprehensive analysis. Such characteristics of the industry as, for example, investment per worker and the associated cost of entry into the market, problems of location and elasticity associated both with demand and resources, and the like, seem especially relevant.

Viability and the Forces Tending to Destroy Organizations

The problem of the survival of an organization through time recurs frequently in these discussions. It seems to come up in two separate forms. Decision theorists—for example, Marschak, Cyert and March—use it to distinguish a set of "one-shot" solutions from longer-term stable equilibria. In the problem Marschak sets for himself, a single decision would have few implications for organizations. It is when we go beyond that to decision rules—to decisions about future decisions—that the problem of structure arises. In coalitions it is unnecessary to deal with all the possible combinations. Only those which meet the minimal standards imposed by the environment are dealt with. Only these will have sufficient life to justify attention as organizations. Bakke and Haire treat it differently. The presence of threats to survival arouses responses within the organism which develop structures or processes to protect it. Haire hypothesizes that the organization will grow strongest where the forces tending to destroy it are strongest. He uses this as an explanatory principle to account for observed patterns of growth. Bakke, somewhat similarly, identifies a set of factors which may be lethal—the conflict between individual and organization, dealt with earlier; difficulties or changes in operations, resources, or activities; and the impact of an unpredictable environment, mentioned just above. These are dealt with by a Fusion Process, a Problem-Solving Process, and a Leadership Process respectively. Thus the long-term shape and acitvities of the organization are partly determined by responses to forces threatening to destroy it.

The problem of viability is necessarily related to the problem of the ecological context. Many (though not all) of the lethal factors are associated with the environment. Indefinite existence is a particular characteristic of an industrial organization, and viability seems especially relevant here. It distinguishes the semi-permanent organization with long-term goals which must be achieved outside itself from the shifting, transitory formation of a host of social groupings observed in everyday life. Finally, it seems likely that, as in other living processes, survival is associated with the development of forms relatively invulnerable to lethal forces in the environment. In dealing with viability, the "natural selection" model readily comes forward. All of these seem to lead toward a continued attention to viability as a characteristic of organizations.

Interdependence among the Social Sciences and General Considerations

As the attack on the problem of organization proceeds on a variety of fronts, it becomes clear that the various social sciences draw heavily on one another, and that there are a group of specific areas where developments exist or are needed to support advance in related disciplines. Cartwright's statement on graph theory in support of linkage notions is a good example. Time after time research workers have returned to some kind of sociometric linkings as one of the basic variables in the problem of organized groups. The developed power of graph theory promises to take the work much further.

The linkage approach is also closely associated with both the problem of information and decision and the consequent implications for organization. Many links in a system may provide participation and hence morale, but they also provide a vulnerability to noise and information loss in transmission. The two need to be studied together to find simultaneous optima. One response to the vulnerability to noise is redundance, but in an organization this means administrative load and consequent cost, as well as, perhaps, a larger group with more links and more vulnerability. Marschak's case reduced links, always counting the cost in optimizing decisions. However, he, too, feels the need for developments outside the field which would make it possible to determine the permissible load. The Executive Quotient for which he asks is just such a measure. Cyert and March's coalitions appear especially where there are indeterminancies in Dubin's linkage system. It seems clear that a group of factors must be handled together—linkages, information, load, decision, and organization structure. The problem is the meeting point of several disciplines.

In a similar fashion, the growth of theories of group organization demands developments related to individual problems of cognition and motivation. Cyert and March's model of coalition demands psychological developments regarding preference-orderings and transitivity in preferences, a detailed application of level-of-aspiration notions to these problems, and a way to treat the shifting attention on both problems and needs. These psychological developments will make it possible to move game theory from the assumption of relatively simple motivation and complete information to more realistic bases of behavior. At the same time, the notion of conservation of utility is abandoned and some of the mathematics already worked out are lost. New mathematical developments are required to support the refinements in behavior theory.

Biological concepts, too, contribute to the joint problem. Haire draws somewhat on them, but Bakke's homeostasis is perhaps the most organismic concept. Tendencies toward self-preservation in an organization are perhaps best dealt with under the heading of viability. Likewise, there is an ability to withstand shock from environmental fluctuations, but this does not seem to be properly homeostasis. Homeostasis implies a mechanism for sensing the level of a particular variable and especially deviation from an appropriate level, a self-correcting mechanism for initiating an adjustmental process to return the level to its proper state and, finally, the means for shutting off the correcting process. The precise application of such a concept requires further definition of specific variables and levels. (Observation of organizations often leads one to wonder if the mechanism for shutting off corrective process is present and functioning properly.) However, demonstration of the relevance of such a concept would provide great power to the organizational theorist. A great many of them approach its use implicitly, for example, in discussions of viability with all the implications both of an evolutionary natural selection and of homeostatic processes to guarantee stable equilibria, but the precise way in which the concept applies still seems unclear.

The use of the concept of homeostasis may be an example of a recurring problem in dealing with organizations. The facts or facets of organizational behavior are so numerous and so complex that we often find theorists using models to represent them, and then dealing with the models. This use of models appears in a variety of forms. Sometimes it is a mathematical model with a relatively explicit definition of variables, and immense power to be gained from the generative capacity of the logical structure. At the other extreme are models which might be called "mere" analogy—models in which a well-known physical structure, mechanical process, or biological organism is used as an example in the hope that it will be an aid to insight into a complex phenomenon. Between these two is a more legitimate use of analogical reasoning. There are cases in which one takes a model already developed in another science and hypothesizes that its characteristics fit organizational processes. When this is done, the power to be gained comes from the application to organizations of already deduced or observed implications in the science from which the model is taken. This process of application is in the nature of hypothesis-testing. If deductions from the model do not fit, the model should be rejected. Frequently it is either not tested in this way or kept on when no deductions can be generated and only the similarity which lead to the original analog remains.

Such a state of affairs leads to a loose and confusing terminology—or, worse still, a situation in which one feels that he understands the theorist, but the meeting is only on the dimmest intuitive level. Is there an action-reaction principle in organizations? Well, yes, in a way. Are communication channels like blood vessels carrying life-giving processes throughout the body? Is there a "queen bee" in the organization? Models of this sort seem designed primarily for the artistic purpose of expression. As such, the terminology seems chiefly to confuse. Models will be invaluable in analysis, but they must fit a variety of characteristics before they will be useful. The model must be explicit and clear in its own structure. It must be capable of generating implications within itself apart from its application. The coordinating definitions tying it to organizational phenomena must be clear, and explicit—these are truisms in scientific method, but they are often unobserved in this field. The result has sometimes been a bewildering collection of terms drawn from other sources, originally designed to aid understanding, but, in their total, often serving to mislead and confuse.

There is another dimension on which the papers presented here array themselves along a broad continuum. They range from the detailed and insightful observation of behavior of, for example, Whyte and Argyris, to the abstract and, superficially, unrepresentative models of, for instance, Marschak and Rapoport. Here there seem clearly to be no "either-or" choice. We will need both the power of the model and the empirical foundation of the naturalist. For some reason, in this field, the abstract theorist feels called upon to defend himself. Marschak points out that the best biochemist will not replace a chef, but biochemistry makes food better. Rapoport insists that his experiments are especially designed to get a quantitative description of what happens under quantitatively describable conditions; no attempt is made at verisimilitude. Simulation might sacrifice the rigor of the model. Argyris and Whyte, on the other hand, feel no need to apologize, since they are observing what is going on. They aim at models capable of supporting the analysis of organizational behavior, but they keep one foot firmly grounded in the detailed report of actual behavior. The broad spectrum of approaches, from abstract to concrete, seems fruitful, and a sign of vigor in the field.

The papers presented here include a great diversity both in approach and in the problems identified. Certain things seem to be lacking, however. As has already been mentioned, there is little discussion of the economic context in which the organization operates. Again, there is relatively little discussion of power in organizations or analysis of bureaucracy in the tradition of Weber. These gaps are partly the result of the particular author's interests, but they may also be part of a shifting focus of attention in this field. In another area, the field still seems to hold to an older, and somewhat outdated, center of interest. Attention still falls largely on the behavior and motives of hourly paid and clerical workers in the organization. When management is studied, it is almost exclusively in terms of decision-making. Surprisingly, there has been relatively little interest in either the motives or the behavior of management outside this one area. In the social sciences in general, when the motivational oversimplification of the concept of economic man was attacked, it gave way to an enriched analysis of the complex motives of workers. By and large, however, the motives of management still seem to be seen in the simple lines of profit maximization, and we have virtually no studies of what management actually does.

In one other sense, the attention here may be unduly focused on the traditional blue-collar worker. The development, particularly in large organizations, of a host of professional specialists and the growing use of automated production techniques shift the balance of the organization somewhat from the broad base of the hourly paid worker which has been the primary problem in the past. Organization theory needs to keep pace in its models with the development of organizations in fact.

These are some of the themes that seem to run through organization theory today. Once more, let the Editor acknowledge responsibility for what he has seen in the papers, and urge the reader to look for himself.

E. WIGHT BAKKE

2.

Concept of the Social Organization

A SURVEY OF THE CURRENT LITERATURE RELATED TO WHAT IS BEGINNING to be called "organizational behavior" reveals a relatively small concern with the clear definition of the nature and structure of a social organization. This contrasts markedly with the traditional concern of anthropologists, sociologists, political scientists, and other students of society and societal institutions with the structural definition of the object of their study.[1] The current literature is filled with generalizations relevant to the interaction of, interdependence of, mutual impact of, divergent interests of, power relations among, competition between, organizations. Likewise, the literature deals extensively with dimensions of, functions of, development of, decision-making within, relations of members to, power structure within, efficient administration of, principles of development of, organizations. But seldom does one find a careful and systematic description of the nature and structure of the "thing" with whose internally and externally directed activity the hypotheses are concerned.

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[1] F. Znaniecki's chapter in Gurvitch and Moore, *Twentieth Century Sociology,* New York, 1945, is an excellent introduction to the wealth of literature on the subject.

In spite of the richness of literature from earlier social scientists on this matter, the current student of organizational behavior will not find a *commonly accepted* definition of the structure of the social organization suitable for his purpose in the study of such specific-purpose organizations as work teams, departments, companies, unions, schools, churches, and the like. He is faced with several alternatives. He can pick one of many conceptual frameworks from a great variety and modify that for his purpose. This has been done frequently and is one major reason why it is so difficult to integrate the findings of current research into a systematic body of knowledge. Another alternative is to attempt a synthesis of the varied definitions used. When I was younger I tried this approach and, at least when in the company of those who have made a similar attempt, I feel no embarrassment about expressing the conviction that the task is impossible. Another alternative is to ignore the problem for all practical purposes by making a ritualistic bow to organizational structure in a sentence or paragraph definition of what is meant by an organization, and then never referring to it again. This is a frequent practice, especially among those with a consuming and all-compelling concentration of interest on some specific kind of variables and their relationships. Another alternative is to let the concept of structure be implicitly revealed in the headings one chooses for the sections or chapters of his report on findings. Finally, one may himself attempt to construct a usable concept of the social organization, empirically or logically, which will bring order and system to the universe of data with which he is concerned.

There is no reason, of course, why every exploration of organizational behavior should be premised by a statement of assumptions relative to the nature and structure of an organization any more than every treatise on the relation of thyroid deficiency to muscular fatigue should be premised by a summary of anatomy. But those who explore the relationships between such biological variables have a common concept of the "organization" whose affairs they are talking about, the human body. That common concept of the organization itself furnishes an organizing instrument of thought which gives a unity and coherence and focus to any number of relations between discrete variables and also provides an important test of the relevancy and appropriateness of the sorts of things scientists consider important to study.

This test of relevancy is not securely present in most current literature when relations between variables concerning the internally and externally directed activities of social organizations are under discussion. One is normally left to infer what concept of the social organization lies back of the problem as stated. When explicit reference is made to the nature of a social organization, the subject is usually covered in a single sentence or paragraph, such as "By organization, we refer to 'a system of interdependent roles,' or 'a system of activities directed toward an organizational purpose,' or 'a group of people engaged over time in a purposeful cooperative endeavor.'" But what is the pattern of the system, or what necessary and adequate types of activities or roles are involved? Such matters are not made clear. There are, of course, notable exceptions to this state of affairs.[2]

I suppose there are those who do not feel that the science of dynamic activity in and of social organizations needs a systematic and commonly held concept of the nature and structure of the social organization itself. Certainly it is more interesting and exciting to treat of the way in which some type of activity or artifact affects another type. And it certainly is possible to develop more hypotheses by that kind of study and thought than are likely to be tested in the lifetime of any of us.[3]

Nevertheless, I am uneasy about this situation. I recall that a concept of the "thing" whose activity and relations were being studied vitally influenced the nature of the hypotheses scientists considered important and which they formulated and set out to test in other fields, the living *organism* in the biological sciences, the human *anatomy* in medicine, *mind* and *personality* in psychology, *matter* in physics, *culture* in anthropology, for instance. Even in these later days when it has become customary to avoid reification of such "things" and to be concerned with "behavior in its steady state," the character and structure of that "steady state" have continued to be the object of systematic and basic study. The "steady-state-of-behavior" approach itself was a development growing out of the concern for a truer and more useful and usable concept of the thing studied.

There are good reasons for this concern in the several sciences, and those of us involved in the study of organizational behavior, that is, the behavior of people within and in relation to social organizations and the behavior of the agents of one social organization with respect to the agents of another social organization, can profitably pause and ask whether those reasons are not present here also. Is our concept of the social organization adequate to enable us to make systematic and cumulative progress toward a science of organizational behavior?

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[2] In the bibliography at the end of this chapter will be found a number of articles and books which have directly concerned themselves with defining the social organization with particular reference to specific-purpose organizations.

[3] See, for example, those in Homans, *The Human Group*, Harcourt, Brace, New York, and in March and Simon, *Organizations*, Wiley, New York.

The negative answer I am inclined to give to this question implies no criticism of my colleagues whose reports and analyses of experience, and of empirical and experimental studies, have contributed so many data and generalizations to our understanding of organizational behavior. It is possibly merely an attempt to provide a justification for a compelling interest I have in trying to define the framework and structure of the social organization, so that in studying the interaction of individuals and such organizations we have at least as clear a picture of the latter as the psychologists have given us of the former. Moreover, I find in the writings of my colleagues, if not explicitly, yet implicitly, stated, their concern with this objective also. I would hope, therefore, that any suggestions made in this paper would be taken as a contribution to, rather than a criticism of, the efforts of both academic researchers and operating agents of social organizations. What are some of the more important uses of a clearer, more comprehensive, and systematic picture of the nature and structure of the social organization?

Uses of a Concept of Social Organization

1. The first important use of a concept of the organization has already been suggested above. It is to provide the researcher with a postulate, that is, an integrated framework of major parts, the relations between and among which will suggest some of the most basic of the theorems and hypotheses significant for his science. This use is, of course, facilitated if the major characteristics of the parts are defined and the nature of their essential interdependence is set forth in the concept of the organization.

In the cumulative development of a science of organizational behavior, theories with respect to the relationship of relatively minor variables can thus contribute to theories with respect to the relationship of relatively major variables, such as the major parts of the organization. Economy of effort in the formulation and testing of hypotheses as to relationships between relatively simple variables will be furthered if the relation of these to more complex variables like "authority system" or "value system" or "system of sanctions" or "body of rules" is clear from the beginning. That clarity is difficult to attain unless some concept of the systematic structure of such parts is available from the beginning.

In other words, unless the multitude of activities carried on within an organization, and the factors affecting and affected by these are related to some systematic framework including both, we are faced with an overwhelming set of detailed variables. It is difficult, if not impossible, to find our way out of the minutiae to a clear conception of the relation of each to a larger totality of interdependent activities and factors. This is no disparagement of the careful, controlled experiments with a limited number of variables and their resultants, for instance, of the effect of the pattern of information flows upon the accuracy or speed of solutions to a given problem by nine people, or the impact of the number of people making contrary judgments, as to the distance a pinpoint of light moves in a dark room, upon the modification of another person's judgment. These relationships are interesting in and of themselves. Lacking any systematic framework which would make it possible to relate such findings to increasingly comprehensive bodies of data, the tendency (not of the original researchers, but of those who utilize their findings) is to project the results to some, at best, distantly related observations (for instance, to "authoritarian pattern of management" or "impact of reference-group standards").

One service of a systematic concept of organizational structure is to indicate the way in which generalizations from the observation of the interaction of relatively simple variables can be compounded and coordinated with other observations to suggest hypotheses with respect to relations among progressively more comprehensive and complex sets of variables.

This is a critical matter in the growth of organizational theory. March and Simon (1958), for instance, have a list of about 200 variables set forth in over 200 hypotheses (of the *X*-is-a-function-of-*Y* type). The number is not unmanageably large if there were some organizing principle such as would be suggested by an adequate concept of the organization and its parts to whose operations the variables are related. One is frequently stimulated to ask, however, "Where do we go from here?" An obvious answer is "Put the hypotheses to the test." Then what? How are these discrete and independently interesting pieces of a more comprehensive body of behavior to be related to, and integrated with the larger whole?

One way is to relate many of them, as March and Simon have done, to a model of the organizational decision-making process. That process is an important aspect of organizational activity, and I for one would not debate the assertion that it is the most important aspect. But it is not the whole of organizational life, and the nature and pattern of decision-making is no more a *completely* identifying feature of the social organization than it is of the personal organization, i.e., the human individual, though it may well be a central and key feature. Its use as a framework for organizing our present knowledge of organizational behavior has, in my judgment, led to some of the most fruitful scientific and practical results to date. But it is not a substitute for a concept of the social organization any more than a model of the operations of the nervous system is a substitute for anatomy as a guide to the study of activities of the body.

2. Another use of a concept of the social organization is to enable students concerned with the study of one major type of organizational behavior to be aware of the other types on the same level of generalization as the first. Weber and many whose concepts are heavily influenced by him are greatly interested in what might be termed the system of authority and division of labor within an organization. Others are interested in the system of communication, others in the system for motivation, still others in the system of production and distribution. Systems of finance, requisition, and maintenance of resources, forecasting, research and planning, integration are also the independent objects of study by particular students. One cannot but raise the question of whether an orderly concept of the total organizational "system" of which these are subsystems would not suggest to such students that an important part of their study should be the nature of the interdependence and interaction of the system which is their object of study with these other systems, and with the whole.

It is customary for students of specific aspects of organizational behavior to include in their commentaries on such aspects the passing acknowledgment that "Of course this is only a part of the picture and this aspect is related to, and interdependent with all other aspects." But lacking a map of the organizational terrain, that is, a concept of the social organization, such a general statement is not likely to suggest hypotheses as to the essential nature of that interdependence and the interactions consequent upon it. Such hypotheses, if substantiated, must certainly be important ingredients in the theory of organizational behavior.

3. Another very practical use of a concept of the social organization is to provide a clue to the repercussions of a change in one part on other parts. Presumably, beyond providing the scientist who is en-

gaged in studying organizational behavior with sheer intellectual enjoyment, there is another purpose to theory building. That is the purpose of providing guidance to those involved in and affected by organizational behavior when they attempt to modify themselves, others, or the organizations concerned in the interests of achieving whatever objectives they have in mind. If the modification of the organization is involved, an understanding of the structure and dynamics of the thing acted upon is essential so that the chain reaction of change in one part, coursing through other parts, can be calculated. It is as essential when the object of change is an organization as when the object is oneself or another individual. It is fair to say, I think, that what is desirable for the practitioner to know about the probable impact of change in one part on other parts is equally important for the scientist to know. An elementary condition of such knowledge would seem to be a clear concept of the parts themselves, their characteristics, and their systematic relations with each other and the whole.

There exist in the literature, for instance, a number of discrete hypotheses of the nature, "The degree of group cohesiveness is a function of the degree to which the group satisfies needs *X*, *Y*, and *Z* of its members." Let us assume that, in the interest of obtaining greater group cohesiveness, it is decided to modify organization features related to the reward and penalty system available for satisfying needs *X*, *Y*, and *Z*, and this is done. What impact on the authority system can that be expected to have? What impact can those effects on the authority system be expected to have on the communication system? What impact will the effects on the communication system probably have on the flow of productive work, etc.?

Most students of organizations infer that such chain reactions are inevitable if in no other way than by their assertion that the "parts" of an organization are interdependent. But what are the parts and what is the dynamic nature of their interdependence? Until the concept of the structure of an organization is clearly and systematically defined, and necessary interdependencies charted among the structural features, such an assertion is a mere challenge to such definition and charting. The assertion does not lead to testable hypotheses concerning the effects of a change in one aspect on other aspects of the organization and on the whole. Given a concept of the essential features of an organization, however, and a growing understanding of the nature of the several parts, testable theorems and hypotheses can be deduced from such a postulate.

The discussions by Merton (1940), Gouldner (1954), and Selznick (1949) of dysfunctions which follow as a chain reaction from the operation of certain processes within a bureaucracy are indications of the significance of this area of theoretical and practical interest.[4] In my judgment, research of this nature will be stimulated and made more systematically cumulative if it can be carried on within a framework of a concept of the essential features of an organization.

4. Another use of a comprehensive concept of the social organization is to alert the student who is framing hypotheses as to the impact of an organization as a whole on an individual's behavior to recognize whether his definition of such an independent variable is adequate or whether the aspects he has chosen to represent the whole are really representative. Perhaps hypotheses of this sort are altogether too presumptuous for the scientist and even for practical managers of organizations. If so, the surest corrective to such presumptuousness would be the awareness of the full content of the "thing" whose effect is of interest. Some of my colleagues, I am sure, would join me in seeing the value to careful research and practice of reducing the tendency to frame such "over-ambitious" hypotheses. But they are going to be framed whether or not we admit them to the respectable company of hypotheses about the relations of relatively simple and operationally definable variables.

Moreover, decisions critical to organizational operations are going to be made on the basis of assumed or demonstrated cause-and-effect relationships of this sort. Suppose we wish to ascertain and explain the comparative degree of satisfaction of employees with a variety of types of organizations, or to ascertain and explain the difference in productivity among the members of several organizations with varying over-all characteristics. Whether such an objective is attainable scientifically is doubtful. But the question is an important one, and the participants in organizational affairs have to assume an answer whether scientists can provide them with any guidance or not. An attempt at guidance frequently takes the form of selecting certain "key" aspects of the organizational structure (say supervision, job content, pay, pattern of authority, etc.), framing questions to determine reactions to such matters, and summarizing the answers as the "reaction to the organization." The aspects chosen may be adequate to define the organization or the perceived organization to which people are reacting. But how do we know unless we have a comprehensive concept of the organization of which these aspects are assumed to be representative, so that we can measure the representativeness of the parts chosen by reference to the whole?

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[4] See March and Simon (1958), pp. 37 ff., for an interesting and provocative summary.

5. Perhaps the need for a concept of social organization becomes clearest in the endeavor to develop theory with respect to organizational behavior in which the activity of organizations as such is the center of attention. There are several such areas in which theory is less adequate than in the area involving the behavior of *individuals* in an organizational setting. Some examples of the areas of theory I am speaking of are as follows:

(*a*) The growth and development of organizations.
(*b*) Relations of sub-organizations of increasing comprehensiveness to each other, e.g., work group to department, department to division, division to company, local union to national, national to federation.
(*c*) Relations of one organization to another, e.g., company to union, company to government, nation to nation, department to department.

One reason we have felt secure in the progress of theory with respect to the behavior of individuals in relation to organizations is that, in the case at least of the individual, we had a relatively common understanding of the nature of the "human" organization. As I have indicated, I think even this area of organizational theory will be aided by the development of a concept of organizational structure. Nevertheless, we have been able to "get by" because much of our "organizational" theory is concerned with the behavior of individuals as modified by organizationally and even personally oriented interests of other individuals. It is appropriate and accurate to include that under the identifying caption of organizational theory. But it is also appropriate to include generalizations concerning the nature, development, and functions of, and the relationships between organizations themselves under that caption. In studying the latter type of problems we require a conception in usable detail of the social organization itself.

6. Another use of an adequate concept of organization is suggested by the growing tendency of students to define the behavior of organizational agents and the stimuli to and constraints upon that behavior in terms which lend themselves to mathematical manipulation. This is a laudable and ambitious effort.

An essential and legitimate part of this effort is the selection of those variables, the nature, activity, and relationships of which are necessary and adequate to determine results which are of interest to the researcher. It goes without saying that one criterion for the selection must be the amenability of the dimensions of the content and activity of the variable to adequate and accurate expression in mathematical terms. Those of us who have immersed ourselves in the rich, varied, and complex content of organizational behavior and factors affecting it for a number of years may be excused, I think, for keeping our fingers crossed on the possibility of including all essential variables by reference to this criterion. While hoping for the success of those who are attempting to make the mathematical tools, so significant to progress of other sciences, available for the advancement of a science of organizational behavior, we would suggest that the variables that it is essential to relate to each other should include the full set of organizational factors impinging on a given result and not merely those manageable by mathematical methodology.

The concept of organization assumed by these researchers will inevitably be a premise, not only for their selection of significant variables, but also for their formulation of hypotheses as to the interaction of these variables. It is important in such selection and formulation that the concept of organization used as a guide to selection should be not merely a summary of features of an organization they have found possible, or believe they ultimately will find possible, to describe in mathematical terms.

7. Finally, a commonly accepted concept of the social organization is almost a minimum requirement for fruitful understanding and collaboration among social scientists whose studies have to do with different kinds of organizations, and between these social scientists on the one hand and the people who will have to test their theories in the practical operation of organizations on the other.

Summary

Here, then, are seven uses or services which an adequate concept of the social organization can perform. The services appear to me exceptionally important to all scientists and practitioners whose work involves the understanding of behavior within and related to such organizations. They are as follows:

1. To suggest to students of one major type of organizational behavior the other types on the same level of generalization and of the same class as that with which they are concerned.
2. To provide a systematic framework of the major parts of a social organization sufficiently specific and structured so that more ele-

mentary variables, and theories with respect to their relationships, can be organized by reference to that framework.

3. To provide both practitioners and scientists concerned with the impact of change in one part of the organization on other parts with a clue to the probable course of the chain reaction following upon the original change.
4. To provide those concerned with the effect of an organization as such upon an individual's behavior or of the individual's behavior on the organization with a test of the representativeness of those features of the organization chosen to represent the organization as a whole.
5. To provide those concerned with the theory of interaction of two or more organizations as such with a structure of organizational parts which assists in comparison and contrast and in identifying critical points of contact between or among those organizations.
6. To provide those concerned with the development of the mathematical analysis of organizational behavior with a comprehensive framework of classes and orders of data to which those amenable to mathematical representation and manipulation must eventually be related.
7. To provide scientists studying different kinds of organizations, and scientists and practical managers of organizations, with a commonly understood focus of attention.

The considerations set forth above are to me sufficiently compelling to justify an attempt to make explicit at least the framework of a concept of the social organization which could perform these services. I have no quarrel with those who feel there are more significant problems demanding their attention. I assume there are many students of organizational behavior who feel this way, for I notice in repeated cases that, having begun their treatises with a relatively short paragraph beginning "An organization may be defined as . . . etc.," they frequently find it unnecessary to make use of that definition in specific ways to lead them to the specific problems which arouse their interest or to guide them in the way they formulate or analyze those problems. Each scientist, at least in a free society, can concern himself with those concepts he feels adequate, necessary, and significant for his purposes. There are some who, like myself, feel uneasy and insecure about exploring the mysteries of organizational behavior without a detailed systematic concept of the structure of one of the major entities whose behavior is being studied and within or by reference to which the whole of the behavior studied takes place. They will, I trust, find the following comments helpful.

Let me invite your attention, therefore, to two matters: (*a*) a set of criteria which, if met by the concept of a social organization, would make it useful in the ways indicated in the foregoing pages; and (*b*) a setting forth of the framework of a concept that I believe comes close to meeting those criteria. In a later paper I shall attempt an evaluation of other concepts by reference to these criteria and a comparison of them with the one here set forth.

Criteria for Content of the Concept

There are three groups of criteria below which, if met by a concept of organization, would facilitate its usefulness in the ways indicated. They are suggested by two experiences. First was the attempt over the years since 1931 to develop a systematic framework for a concept which would provide not merely a classificatory scheme for the variables related to the ten organizations I was involved in studying, but a clue to the necessary and logical dynamic relations among those variables. The second experience was the attempt to relate the implicit or explicit concepts of the organization held by my colleagues to the kinds of generalizations they made about behavior within or related to those organizations and to bring their findings to bear upon the correction of my own.

Consistency with reality

The first two criteria have to do with the consistency of the concept of a social organization with reality.

1. The concept as a whole and the parts constituting its structure should reflect a living, operating entity recognizable by those related to a social organization as the actual sort of thing to which they are related. This does not mean that it is not necessary and legitimate to abstract from the total concept for analytical purposes other whole models (the formal system, the external and internal systems, the decision-making process, etc., for instance). But these will profit even as discrete tools for thought by being true abstractions whose dimensions are defined by reference to and are consistent with the dimensions of the whole, the whole as an operating entity. A concept of an organization "that doesn't work out that way in the actual world" is not the kind of a concept which provides a reliable test of the adequacy of the abstractions as a framework for meaningful analysis.

If the latter are to be more than the equipment for intellectual exercise, the findings to which they lead must ultimately be capable of testing by reference to empirical evidence obtained from observing the behavior related to operating organizations. The perennial problem of social science model-builders, with exciting theoretical results to verify by reference to empirical data, is to find a going organization sufficiently resembling their model to make such a test possible. Volumes of such unverified results rest upon the shelves of our libraries. They are very helpful in training young scientists in the methods of producing more such volumes. Being a member of the fraternity which is bound together by a common intellectual satisfaction in such model-building, it ill behooves me to criticize my fraternity brothers, and I shall not do so.

There is no harm in suggesting, however, that since results of our research, if used at all, must be consistent with the living reality of going organizations, the chances of such consistency will be increased by beginning with, and constantly making reference to as we proceed, a concept of organization that resembles as closely as possible the reality to which our end results must be related.

It is a clear inference from this point of view that the basic "stuff" of organization represented by the concept should be behavior, behavior in its steady state which makes the organization recognizable as a unique entity over time. Obviously the description of this steady state requires the use of a pattern or model. But this pattern or model is just that. Moreover, without a description of the particular basic resources utilized by an organization, its distinguishing features would be incompletely presented. The general concept, therefore, in order to reflect the reality of any organization to which it is applied, would focus upon behavior in its steady state together with the resources utilized and "organized" into a unique functioning whole by that behavior.

A concept which meets this criterion will prove useful in all seven of the ways mentioned on pages 25 and 26.

2. Closely related to this criterion is the second. It is desirable that both scientists and people who produce, in organizations, the behavior about which scientists make the generalizations, should be able to recognize the variables incorporated in the concept of a social organization as significant ones for them, if translated into the language in which they customarily do their thinking. I find it difficult to imagine any variable significant to either group which is insignificant for the interests of the other. But the language used to express them may not elicit images of real things recognized as significant. In view of the fact that ultimately the body of knowledge labeled organizational theory will find its adequacy tested by its impact on organizational operations, and much of the research essential to its develop-

ment must be carried on in "laboratories" managed by those who operate going organizations, a mutual effort at communicating in a common language, at least with respect to the basic concept of an organization and its framework of essential parts, would appear highly desirable.

But it is the set of variables themselves, considered significant by each group, which concerns us and not merely the language in which they are defined. If the scientist has neglected some variable which a substantial number of thoughtful managers consider critically important in the successful operation of their organizations, he would do well to try to find a place for it, and a significant relationship of it to the other variables, in the framework of his concept. It is to be expected that one would go on to suggest that the managers also might with profit consider integrating any variable found important by a substantial number of organizational theorists into their working concept of the organization.

Meeting this criterion will be helpful in enabling the concept to satisfy services 6 and 7 mentioned in the first section on pages 25 and 26.

Interaction and interdependence of parts

The next group of six criteria have to do with the ways in which the concept can and should suggest the interaction and essential interdependence of the parts chosen to constitute the framework of the concept. Such criteria, if met, will assure the concept of a dynamic rather than a static, diagrammatic character, to match the dynamic character of the living reality it attempts to represent.

3. The third criterion seeks to suggest a logical, causal relation between the parts chosen to represent the structure of the organization and the characteristics of the organization produced by its operations. The "parts" constituting the major elements in the concept of an organization should be recognizable by both scientists and practitioners as variables essential to the achievement of significant end results characterizing the operations of the organization, such as, for example, continuity, stability, and efficiency. Moreover, the definition of the "parts" should suggest this relevancy.

One way of testing for this criterion would be to ascertain that the parts as defined fit into this formula: "If *X* (result) is to be achieved, then *Y* (a condition) must obtain, and for the existence of that condition, Z (the part) is essential."

This relationship is particularly important because a large number of hypotheses formulated by organizational theorists contain such "resulting characteristics" as either independent or dependent variables. Some researchers, notably those at Ohio State (Shartle, 1956), consider these characteristics (such as cohesiveness, flexibility, stability, polarization, etc.) so important that they are *the* framework of dimensions by reference to which they describe an organization. Such variables will certainly have an important place in a theory of organizational behavior, but they are not among the elements to be recorded as constituting the structure of the organization any more than temperature, coordination, etc., are considered to be "parts" of the human body.

Meeting this criterion will contribute to the effectiveness of the concept in performing services 1, 3, 5, and 6 mentioned in the first section.

4. In the fourth place, the parts constituting the elements in the structure of the organization should be related to the whole by reference to one or more common distinguishing characteristics which have a necessary functional and logical relation to the performance of the function and perceived function of the organization. Certain parts might, for instance, have the common characteristic of *resources* essential to such performance, others might have the common characteristic *of activity systems* or *processes* essential to the acquisition, perpetuation, and utilization of those resources.

The same type of formula utilized in Criterion 3 is useful here. It would read "If A_0 (the organizational function) is to be performed, then the characteristic contribution of F_1 (class of factor) is required, and this necessarily includes the characteristic contribution of Z_1 (the specific species of the class F_1)."

It would help greatly also to promote clear and systematic thinking if the terms used to define the essential parts of an organization performing the same type of function indicated that the parts belonged to the same class. My own early work was confusing in this respect. It listed on the same level of generalization, for instance, (*a*) the Authority bond, which suggests a system of rights and obligations, (*b*) Status bond, which suggests a pattern of results, and (*c*) the Workflow bond, which suggests a series of activities.

As useful and suggestive as are Weber's characteristic features of a bureaucracy, they are impossible to classify in the way suggested by this criterion. Unless the parts can be related to the whole by some such necessary tie, one will always find it difficult to answer the question, "Just why these features and not others?" Moreover, it will be difficult to meet the next criterion related to interdependence among the parts.

A concept which meets this criterion will be useful in ways 1 and 3 suggested on pages 25 and 26.

5. Criterion 5 follows closely from the one just named. The content of parts should be so defined as to indicate the necessary and logical functional relationship of each part to all the others and to the whole. They should not, for instance, constitute mere categories into which all elementary factors can be classified. The parts of an organization, in other words, should not merely be diagrammed as parts of a pattern or chart but as dynamic units whose description suggests the character of their dynamic interaction with each other and with the whole. Moreover, the content of the parts should be sufficiently specified and structured to suggest the nature of the interaction among the parts, between the parts and the whole, and between the environment and both the parts and the whole.

The formula utilized in Criterions 3 and 4 is useful here. It would read: "In order that A_{z1} (function of a particular part) may be performed, the characteristic contribution of Z_2, or Z_3, or Z_4, etc., (other particular parts) is required."

A concept of the nature, "An organization is a group of people who follow rules supposed to further their common interest," does not satisfy this requirement. Neither does the definition of an organization as "a system of interrelated roles." The actual content of such terms as rules, interests, and roles needs to be clarified not as to specific, empirical content but as to the *types* of content descriptive of such generalities.

If this criterion is met, it should be possible to use the parts as postulates from which can be deduced theorems and hypotheses as to relations between and among parts as defined. The concept would, therefore, be capable of uses 1, 3, and 6, mentioned on pages 25 and 26.

6. The parts constituting the elements in the structure of an organization at the highest level of generalization should be capable of subsuming in a descending hierarchy of specificity all of the most elementary factors believed essential to describe and explain the activities of the organization. Putting it differently, each elementary factor should ultimately find its place through an ascending and increasingly comprehensive set of classifications in one or more of the structural elements at the highest level of generalization. If it cannot, then either the definition of the parts at the highest level of generalization is faulty or the elementary factor involved is actually not essential as believed.

Meeting this criterion enables the concept to serve uses 1, 2, and 3, mentioned on pages 25 and 26.

7. There may be those who will challenge Criterion 7, but its importance to a theory of the integration of individuals to the organization is obvious. The parts constituting the elements in the structure of the organization should have a dynamic relationship to all participants in the organization.

This is not to say that the relationship should be identical, for this would be inconsistent with the fact that members have differentiated functions, as well as different inherent and acquired characteristics. But it would be very helpful in studying relations among the several participants in the organization, if the parts were of such a nature that all participants were involved in definable ways in contributing to and receiving stimuli from those parts. For example, this situation is, of course, normally inferred even by those whose structural parts would contain, for instance, "the process of command." On the surface such a process would seem to involve "commanders" only. But some response is assumed. It would seem to me advantageous in this and other similar instances to include *explicitly* the process of *response* as a legitimate part of the organizational structure *on an equal footing with the initiating activity.* Where activity systems are utilized as parts of the concept of what an organization is, the explicit inclusion of the responding activity will satisfy this criterion to some degree.

Meeting this criterion is especially relevant to uses 1, 3, and 4, mentioned on pages 25 and 26.

8. The final criterion related to including an indication of the nature of interactions and interdependencies in the concept of the organization is concerned with making possible the study of the way basic patterns of organizational behavior are integrated with patterns of individual behavior on the one hand and patterns of behavior in the environment on the other.

The nature of the parts as defined should suggest the possibility of an unbroken continuity of the reciprocal relations of internal resources (particularly people), through the intervening activity systems utilizing the resources, with the external environment. The organization should not, in other words, be viewed as a closed system.

Putting it differently, the nature of the parts constituting the elements in the structure of the organization, those constituting the elements in the structure of the human members of the organization, and those constituting the elements in the structure of the environment should be capable of dynamic integration with each other, and the definition of all three should suggest the character of that integration. To the degree that there can be described a similarity in the framework of parts among all three, the framing of hypotheses concerning the nature of this multiple relationship will be facilitated.

If this criterion is met, the performance of services 1, 3, 5, and 6, mentioned on pages 25 and 26, is facilitated.

Comprehensiveness

The final group of two criteria contains those which seek to assure that the comprehensiveness of content of the concept and its applicability will be adequate to the uses to which it is put.

9. The ninth criterion is concerned with the comprehensiveness of the parts chosen as constituting the essential elements of the organization. Those parts should be so defined that it is clear they provide categories in which can be placed all the factors which affect operations of the organization both as to the integration of internal parts and the adaptation of both parts and the whole to the external environment.

There is little danger that "activities" as a general category will be neglected in our day. The terms, "system of cooperative activities," or "system of social action" are familiar ones in the literature. Such terms focus immediate and inescapable attention on a significant emphasis which is not, however, precisely clear in other more formal definitions of an organization as a "system of interdependent roles," or even a "group of people differentiated as to their responsibilities for the task of achieving a common goal." Neither of these frameworks, however, includes in the parts of an organization the material and ideological resources which, together with human resources or people, are woven into an operating whole by the system of activities. I cannot appraise as logically or operationally complete a concept of *the* organization which relegates to an external environment outside the organization itself, for instance, the technical equipment, the material stuff worked on, the plant facilities in which organizational behavior takes place, the capital utilized in operations, or the major ideological premises used as a stimulus to, or corrective of, decisions made and actions considered appropriate. It is, of course, necessary for analytical purposes to relate these factors to classes of phenomena which are distinguished from the system of activities through which they are utilized. But they are parts of the whole complex of factors which characterize any particular organization and provide variables, often unique to that organization, as important in formulating hypotheses about organizational behavior as the content or pattern of the behavior itself.

But even concepts of organization which place emphasis on *activities* frequently limit the sorts of activity considered appropriate for inclusion in a definition of the organization to some class of activities; for instance, they may be limited to those which are planned for and expected by organizational agents, or those which accord with shared norms. Again it may be desirable for analytical purposes to classify activities in a number of ways (e.g., formal and informal, normal and deviational, outwardly- and inwardly-directed). This will be done in the concept of organization proposed. But *all* orders of behavior are ingredients in the totality of the organization. In actual life they are blended together in the organizational behavior-manifestations which determine the structure or steady state of that behavior. The pattern of that steady state is not identical, for instance, with the formally planned behavior, nor with organizational role behavior. Nor is it identical with behavior in accordance with shared norms. Moreover, it is the "blending" to which people within and outside the organization react.

In including the totality of factors, resources as well as activities, and all types of activities, we cannot, of course, escape the necessity of meeting the criteria set forth in the foregoing section. Their relationship to, and interaction with each other must be suggested by the concept. That set of criteria requires that the parts of the organization named be more than pigeonholes for classifying identifying phenomena.

Meeting Criterion 9 will help the concept to perform services 1, 2, 4, and 6, mentioned on pages 25 and 26.

10. Finally, the concept of organization should be useful as a framework for the study of organizational behavior within, and in relation to, all types of specific-purpose social organizations,

(*a*) whatever the area of human interest and need it is the function of the organization to serve (economic, political, military, educational, familial, recreational, religious, etc.), and
(*b*) whatever the degree of their comprehensiveness (work team, department, division, company, etc.).

At the moment each social science has its own concept of the structure of the organization or organizations with which it deals, the business firm (none for sub-organizations within the business firm), the army, the government bureau, the political party, the church, the trade union, the tribe, the family, the school, and the municipal, state, and national government.

The biological sciences have a concept of organic structure that enables research done on organisms as diverse as fruit flies, white mice, hamsters, dogs, apes, and humans to be mutually helpful to each other. Is it beyond hope that we can develop a concept of the social organization which gives the same advantage to organizational theory concerning the "life" and relations of organizations as diverse as those mentioned above? Malinowski (1941) and Parsons (1956) have come closest to providing us with a common concept of a structure relevant to the description of all organizations, although I find a number of unsatisfactory features in their concepts when tested against the criteria set forth above.

As suggested in the discussion of Criterion 8 above, the more similarities which can be established between the concept of the structure of a social organization and the structure of the individual human "organization" on the one hand, and the structure of the environment on the other hand, the easier will become the study of the interaction among and integration of behaviors associated with these entities.

Meeting this criterion is especially relevant to adequate performance of services 5 and 7 mentioned on pages 25 and 26.

Summary

Here we have three sets of criteria for testing the usefulness and adequacy of a concept of the social organization. They have been derived from the attempt to formulate such a concept which would be consistent with the data on organizations and organizational behavior gathered in the course of my own research and in trying to find a common ground of thought with colleagues who have been engaged in the same process. The criteria are as follows:

A. Criteria seeking to assure consistency of the concept with reality.
   1. The concept of the whole and parts should reflect a living, recognizable entity.
   2. The parts should be recognized by both scientists and practical managers of organizations as significant to their concerns.

B. Criteria seeking to make it possible to chart the interactions and interdependence among the parts.
   3. The parts should be recognizable as variables essential to the achievement of end-result characteristics of an organization or its parts (such as flexibility, stability, etc.) which

frequently, in their turn, become variables in theories of organizational behavior.

4. The parts should be related to the whole by reference to a common characteristic (or characteristics) having a necessary and logical functional relation to the performance of the organization's function.
5. The parts should be so defined as to indicate their logical and necessary functional relation to each other and to the whole, and not merely to suggest their usefulness as a set of categories for classifying variables.
6. Major parts should be capable of subsuming all elementary parts necessary to the explanation of organizational behavior.
7. The parts should have a necessary relation to the behavior of all participants in the organization.
8. The kind and pattern of interaction among the parts should indicate an unbroken continuity of reciprocal relations from individual participants, through systems of activity, to the surrounding environment.

C. Criteria seeking to assure the comprehensiveness and applicability of the concept.

9. The parts chosen to constitute the structural framework of the organization should find a place for all phenomena affecting behavior of, within, and in relation to a social organization.
10. The concept should be usable as a framework for describing and analyzing the relationships among all types of specific-purpose organizations.

Concept of Social Organization Defined

We now face the task of defining the whole and the parts of a social organization in a way which will lend itself to the uses and meet the criteria set forth above.[5]

It is helpful to start with an over-all definition which then can be amplified and made operational by more specific definition of the "parts" implied.

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[5] The present concept has developed from a "structure-of-living" framework designed originally for the study of self-help exchanges set up by unemployed workers in the depression in 1932. That framework has been corrected and amplified by use in the study of ten organizations since that time. Earlier editions will be found in the items of the Yale studies in the bibliography.

A social organization is a continuing system of differentiated and coordinated human activities utilizing, transforming, and welding together a specific set of human, material, capital, ideational, and natural resources into a unique problem-solving whole engaged in satisfying particular human needs in interaction with other systems of human activities and resources in its environment.

The major features essential to a more specific definition of a particular social organization would therefore be:

1. *The Organizational Charter* or the image of the organization's unique wholeness.
2. *The Basic Resources,* human, material, capital, ideational, and natural, utilized in organizational activities.
3. *The Activity Processes* essential to the acquisition, maintenance, and utilization of these basic resources for the performance of the organization's function.
4. *The Bonds of Organization*[6] integrating into operating systems (*a*) each of the activity processes, (*b*) the objective provided for it by the organizational charter, and (*c*) the contributions to its operation of elements of the basic resources and the other essential processes. Each system or bond functions to develop and actualize the image of the organization's unique wholeness and to relate the organization and its parts to the external environment.

We turn to the definition of each of these features.

Organizational Charter

In many relationships of participants and outsiders to a social organization, it is essential that those involved have an adequate image of the uniqueness and wholeness of the organization. It is essential that the organization as a whole mean something definite, that the name of the organization call to mind unique, identifying features. This image and its content we label the *Organizational Charter.* The Organizational Charter facilitates the relation of people and other organizations to a specific organization in the same way that the concept of Personality or Character facilitates the relation of individual people to each other.

It is the conception held by participants in the organization of what the name of the organization stands for, together with their basic and shared values, which tend to justify and legitimize such identifying features. Efforts to maintain the integrity of the organization will be governed by what is necessary to actualize and perpetuate this image of unique wholeness. It is basically a set of ideas shared by the participants which may or may not be embodied in written documents. Such embodiment has practical advantages but is by no means essential to its existence and definition.

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[6] It will be noted that the Bonds add no new *elementary parts.* They constitute an integration of the first three parts named into operating systems.

In many cases the elements in the Organizational Charter will be found in features of the organization constituting elements of the basic resources and essential activities. But although it is the image of the unique *wholeness* of the organization, it is not by any means a *summation* of its parts. It is created by selecting, highlighting, and combining those elements which represent the *unique* whole character of the organization and to which uniqueness and wholeness all features of the organization and its operations tend to be oriented. Such activities we shall refer to later as the Identification Process.

The Organizational Charter contains at least the following identifying features of the organization:

1. The name of the organization.
2. The function of the organization in relation to its environment and its participants.
3. The major goal or goals toward the realization of which the organization, through its system of activities, is expected by participants to employ its resources (including themselves).
4. The major policies related to the fulfilling of this function and the achievement of these major goals to which agents of the organization are committed.
5. The major characteristics of the reciprocal rights and obligations of the organization and its participants with respect to each other.
6. The major characteristics of the reciprocal rights and obligations with respect to each other of the organization, and people and organizations in the environment.
7. The significance of the organization for the self-realization of people and organizations inside and outside the organization in question.
8. The value premises legitimizing the function, goals, policies, rights and obligations, and significance for people inside and outside the organization.
9. The symbols used to clarify, focus attention upon, and reinforce the above, and to gain acceptance from people inside and outside

> the organization. These symbols are actually particular items of the several basic resources which serve as cues to bring to mind the content of the Organizational Charter and reinforce its hold upon the minds of both participants and outsiders.

The Organizational Charter as defined has a number of similarities to, but is not identical with, Parsons' concept of "the Value System" and Malinowski's concept of "the Charter."

The basic resources

The basic resources essential to the operation of an organization are those human, material, capital, ideational, and natural elements in the world which are employed by the agents of the organization in its activities. The nature of these resources, their quality, their quantity, and their specific attributes are of a high level of importance in determining the structure of the organization, for they necessarily dictate the kinds of activities which are appropriate to their acquisition, maintenance, transformation, and employment, and they determine certain limits within which the Organizational Charter can be actualized. One of the most important factors leading to the "steady state" of organizational activities will be the persistency of the quantity and quality of the resources employed and, therefore, the need for adaptation to these continuing attributes.

We shall include not only actual but potential resources in this class of organizational parts to the extent that the quantity and quality of potential resources are considerations influencing the behavior which goes on "within" an organization. This will appear questionable to some. But since we need to include outwardly as well as inwardly directed activities of organizational agents in defining the reality of an organization's structure, it is not possible to exclude the object of such activities.

It would, of course, be possible to incorporate in the definition of an organization only those resources currently "owned" and used, and to relegate all others to that catch-all for things difficult to observe and define, the "external environment." But as long as we distinguish between actual and potential resources in our framework of included elements (for their impact, of course, is of a different order), there is clear advantage to bringing both together as influences bearing on many aspects of organizational behavior.

Consider, for instance, the determinants of a company's personnel policy and practice. Activities, even those directed entirely toward present employees of the firm, will be governed not only by the number and quality of present employees (actual human resources) but by the quantity and quality of possible employees in the available relevant labor market (potential human resources).

To undertake, in describing the structure of an organization, the recording of the totality of its basic resources would appear a mountainous task. And so it is. It is probably wise in actual research, therefore, to record and indicate the influence of that portion of those resources actually involved in the problem under consideration. But in determining what those are, it would be wise to remember that some resources of all classes are directly or indirectly involved in every problem.

One feasible approach to the matter of what items of basic resources to include in the description of an organization is to relate those items as objects, instruments, or products of the systems of activity to be named below. For instance, the system of communication activities is influenced by particular attributes of particular people, materials, and ideas involved in activities of that sort. The investigation of problems related to the communication system will profit from a concept of that system which has a place for the definition of these resources employed in the process.

There follows a brief discussion of each of the basic resources.

1. Human Resources or simply *People.* The people who are participants in the organization and their biological equipment, their abilities (thinking, doing, feeling), their predispositions (attitudes, habits, sentiments), and their self-conceptions are the most prominent of the organization's basic resources. That prominence causes a number of scientists to focus their definition of an organization by beginning, "An organization is a group (or an aggregate) of people . . . etc." If one thinks of people as a resource whose attributes determine and are determined by organizational behavior, then the following classes of people must be considered, although the first class will, of course, receive greatest attention.

(*a*) People presently interacting with each other as agents or members of the organization.
(*b*) People potentially available as agents or members of the organization.
(*c*) People who are not agents or members of the organization who are presently interacting in essential ways with agents or members in carrying on operations of the organization, or who are potentially available for doing so.

2. Material Resources or simply *Materials.* The material resources are those of raw materials, equipment, and plant presently owned by the organization and employed in operations of the organization, or those which are potentially available for ownership or employment. These are distinguished from natural resources by the fact that they have been processed through human activity.

Since the emphasis generated by the Hawthorne experiments, on human relations as a determining factor in organizational behavior, comparatively little attention has been paid by academic researchers to materials and their attributes as variables. They are, however, parts of the whole organization to which human beings react and with which they are involved and they have a legitimate place among the parts of an organization affecting and affected by other parts.

In previous writings I have included capital among material resources and, though this is logically defensible, the character of its use in organizational operations is so distinctive that clarity of analysis is promoted by allocating it to a separate category.

3. Capital Resources or simply *Capital.* Capital resources are the wealth or symbols of wealth owned and utilized or available for ownership and utilization in acquiring, transforming, and welding together the other resources of the organization.

4. Natural Resources or simply *Nature.* Natural resources are the products of nature (not processed through human activity), owned and/or utilized, or available for ownership and/or utilization by the organization. Note that what may be called material, organic, animal, and spiritual kingdoms of nature are included.

5. Ideational Resources or simply *Ideas and Language.* The ideational resources are the ideas used or available for use by agents or members of the organization, and by those outside the organization whose behavior affects the operations of the organization, and the Language in which these are expressed and communicated.

These ideas are so numerous and so varied that it is almost presumptuous to attempt to classify them. In sum, of course, the resource Ideas comprehends the whole of the mental constructs (and the Language used for their expression) which reflect the perceptions and interpretations people have of themselves, of others, of the aspects of their world which affect them, the appropriate and actual relationships among all these, and the principles which govern these relationships.

In spite of the obvious presumptuousness of attempting a logically defensible framework for the classification of such a vast body of ideational phenomena, some attempt at a classification usable for purposes of organizational theory-building must be made for several reasons. In the first place, the wisdom of practical experience revolts against the attempt to explain organizational behavior without reference to the nature, quantity, and quality of ideas which are commonly observed to stimulate, modify, and justify the decisions and actions of participants in an organization and of those outside it who affect its operations. In the second place, the whole purpose of research in organizational behavior is to produce ideas which, if ever used, will have to be integrated with ideas presently influencing the character of that behavior. In the third place, it ill behooves those of us whose basic product is ideas to use the magnitude of the task as an excuse to neglect it rather than as a challenge to tackle it.

It is legitimate, I think, to begin, not with an attempted classification of the totality of ideas, but with those which, in the course of my investigations of organizations and in consultations with the management and leadership of organizations, have appeared to be major premises and assumptions which (*a*) stimulated, (*b*) guided, and were used (*c*) to correct and (*d*) to justify decisions and actions of the participants whose organizational behavior was involved. Such major premises and assumptions are the ideational elements most frequently found as variables in the hypotheses proposed by the students of organizational behavior and are of greatest interest to the participants in organizations with which I have been associated.

These major premises and assumptions can be classified as follows:

1. Concepts of *values* held and values shared (e.g., organizational, group, and personal ideals, beliefs, norms, standards, criteria, and focal goals, such as security, progress, and justice).
2. Concepts of the *self* held by participants.
3. Concepts of the *character of the organization* (e.g., its nature, function, goals, systems of basic problem-solving activities, authority structure, power).
4. Concepts of the *individual's position and standing* with respect to the organization and its participants (e.g., reciprocal rights and obligations, opportunity for self-realization, character of group life and the individual's relation to it).
5. Concepts of *facilities* used by the organization and its agents (e.g., policies, plans, rules, activity specifications, technology, rewards, and penalties).
6. Concepts of the nature and attributes of the *basic resources* of the organization and its participants (e.g., of materials and equipment, people, ideas, capital, nature).

7. Organized *bodies of data* used as instruments of decision-making (e.g., forecasts, costs, budgets, accounts, reports).
8. Organized *bodies of knowledge* utilized by agents of the organization (e.g., basic sciences).
9. Concepts of the nature of the *environment and its power* to affect the operations of the organization.
10. Roster of *familiar strategies* for solving recurring problems.

The above categories have no logical justification beyond the fact that they serve as an adequate framework for classifying the major premises that have seemed to me to be significant variables in the complexes of organizational behavior I have observed, plus the fact that the name of the category does suggest the areas of organizational activity to which the ideas included in it are likely to be related.

In spite of the very elementary character of the definition of this basic resource, it is necessary that it be included as an essential part of organizational structure. Organizations are differentiated from one another by the kinds of ideas used as major premises and reinforcements for the activity of their agents and members. Such differences are observed to be reflected in differences in the behavior of agents and members. One of the major preoccupations of organizational agents is to keep the stock of such ideas, both their quantity and quality, adequate for the effective and efficient operation of the organization. We can resolve not to neglect these major premises among the variables we seek to identify in our descriptions of organizations. One day one of our number will provide us with a systematic framework for the study of the nature of this basic organizational resource, the interaction it has through the various activity systems with the other resources, and the character of its contribution to the results achieved by organizational behavior.

Systems of activity or processes

We turn now to the definition of that aspect of the social organization which gives it its dynamic character, its systems of activities or *Essential Processes.* The social organization "lives" by means of the activities which (*a*) develop and legitimize its organizational charter, (*b*) acquire, maintain, transform, and utilize its basic resources in achieving its objectives, and (*c*) preserve its unique wholeness in the face of internal and external problems and change.

All organizational theorists who explicitly define their concept of organization give a prominent place to such systems of behavior. But they differ as to what kinds of behavior they consider admissible as "organizational." Some admit only "formal" behavior, and different theorists mean different things by "formal." Some admit only "organizational-role" behavior, and different theorists mean different things by "role." Some admit only "planned" behavior, and different theorists have different ideas about who makes the plans. Some admit only reciprocal activities of participants in the organization, and others include the activities of outsiders, such as customers, suppliers, etc.

I see no operational or logical justification for excluding from the concept of the organization *any* behavior carried on by participants of the organization while they are engaged in work on behalf of the organization. The steady state of behavior in an organization is the steady state of whatever behavior is taking place. For instance, suppose we are concerned with the reaction of a foreman to a *recurring* short-circuiting of him in communications from the production manager to this foreman's subordinates. Let us assume that such a practice departs from the communication route formulated and approved by the factory manager. In describing this organization's communication system, shall we refer to the actual pattern, the formulated and approved pattern, or both? Suppose the factory manager approves of, and in certain cases insists upon level-skipping, but that the production engineer (being a good bureaucrat) always follows the direct line of authority. Which route now constitutes the organization's pattern of communication activity? If any actual behavior of participants is not admitted as the "stuff" of which the organization is composed, then to what class of phenomena is it assigned when we must use such behavior as a variable in explaining the operations within the organization? Shall it be assigned to the external environment?

I see no way to avoid the conclusion that *all* behavior carried on by participants in the organization must be considered as the substance of the organization and that any systematic classification of behavior to portray the organization's structure will have to be according to some principle which makes possible the relevancy of all that behavior to the structure.

The basic principle which seems to me most appropriate for that purpose is "the actual behavior in its steady state," that is, the patterns of actual observed behavior which recur and persist in response to recurrent situations calling for activity.

Let me be more specific and at the same time indicate certain aspects of such a behavioral totality to which it is desirable to refer in describing the actual behavior. The behavior which is the substance of the organization will include that which can be classified by reference to:

(*a*) The *source of the expectancies* with which it accords.
(*b*) The *primacy of its manifestation,* that is, whether it is an expression of initiation or response.
(*c*) *Its consistency with certain norms.*
(*d*) Its *direction,* i.e., toward participants' or outsiders.

1. The behavior which is the substance of the organization may accord with several sets of expectancies:

(*a*) The expectancies which, as can be inferred from formulated and announced specifications and rules, the managers of the organization *should* hold with respect to their subordinates.
(*b*) The expectancies which *are* held by the superordinate to whom the actor is subordinate.
(*c*) The expectancies held by others with whom the actor is directly associated in tasks performed for the organization.
(*d*) The expectancies held by those belonging to a circle of participants with which the actor feels himself identified.
(*e*) The expectancies which the actor has for himself.

Behavior which accords with the first two types is normally classified as "formal" behavior; that which accords with the others as "informal" behavior. Since the expectancies so classified are obviously not necessarily the same, I find the classification of behavior responding to them as "formal-informal" of little service. I judge it of little service to researchers also, for although the words appear frequently in general discussion of organizational affairs, they infrequently are found as descriptive terms of types of behavior used as variables in hypotheses which are intended to be tested.

If one's attention is focused on activity as the substance of organization, he observes behavior that is a response to a fusion the actor has made of all five types of expectancies mentioned above.

A minimum requirement for handling this situation would seem to be an attempt to identify the aspects of an activity corresponding to the several sources of those expectancies. It can be suggested for the latter purpose that we classify those aspects as follows:[7]

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[7] It will be noticed that the word "task" is used to identify that aspect of activity responding to expectancies of others to whom the actor is related in work for the organization, and that the word "act" is used to identify that aspect of activity responding to the expectancies the actor has for himself. The latter may, of course, have originated as responses to expectancies held by others both inside and outside the organization, expectancies which now are internalized by the actor as "what he expects of himself."

Those Aspects Responding to Expectancies:	May Be Identified as:
(*a*) Inferred from organizational specifications and rules	(*a*) The organizational task aspect or simply, *organizational task*, type *a*
(*b*) Held by the actor's immediate supervisor	(*b*) *organizational task*, type *b*
(*c*) Held by associates of the actor in work performance	(*c*) the cooperative task aspect or simply, *cooperative task*
(*d*) Held by a circle of associates with which the actor feels identified	(*d*) the group task aspect or simply, *group task*
(*e*) Held by the actor as to his own behavior	(*e*) the personal act aspect or simply, *personal act*

This can be visualized more clearly, if we take a single unit of activity involving the giving of an order to a subordinate by a department manager as follows:

> (1) John, the President wants me to make a report on the way that training program worked out last year.
>
> (2) You're familiar with the way such reports are set up, so would you rough out a draft for me?
>
> (3) You know pretty well what I think of it, so you can work that in, but of course I want you to feel free to call the tune as you see it.
>
> (4) The fellows we used as instructors have been in to see me several times and thought the thing went over big. Maybe you could profit by sounding them out again.
>
> (5) Remember one thing though, we liberal guys in Personnel have an uphill battle to fight in this organization and our chance to get things done right [i.e., "our way"] will be affected by the boss's reaction to that report.
>
> (6) I don't need to tell you that I personally took a big gamble on giving the program its democratic emphasis.
>
> (7) But I think we understand each other on these matters.

Here is a single organizational activity involving elements of communication and direction. It can be assumed, I think, that its impact on the organization's operations (first of all in the response of the subordinate) will be a function of the totality of instructions given. Those instructions reveal several sources of expectancies influencing the kind of instructions given, and the subordinate can scarcely afford to ignore any of them.

Seen from the department manager's point of view, the sentences reveal a response to expectancies corresponding to the following aspects of his activity:

Organizational Task:	Sentences 1 and 2
Cooperative Task:	Sentences 3, 4, and 7
Group Task:	Sentence 5
Personal Act:	Sentences 3, 6, and 7

Seen from the subordinate's point of view, the sentences reveal expectancies corresponding to the following aspects of the activity he is ordered to undertake:

Organizational Task, type (*a*):	Sentences 1 and 2
Organizational Task, type (*b*):	Sentences 2 and 3 and, to some extent all the sentences
Cooperative Task:	Sentence 4
Group Task:	Sentence 5
Personal Act:	Sentence 7

If hypotheses were to be developed about the predictable response of the subordinate to this order, it would seem unlikely that we could be satisfied with an activity-variable which sets forth the nature of just one aspect of this unit of behavior. Moreover, an intervening variable would have to indicate the relative weight given by the subordinate to these various aspects in determining his own behavior, that is his expectancies of himself.

2. The behavior which is the substance of an organization includes both that *which initiates action for another and the other's response.* For example, for every activity of giving an order there is one of receiving and acting upon the order. Both are essential to describing how the system of direction or command works. This is true of all types of activity, such as producing, directing, communicating, rewarding, penalizing, etc.

3. The behavior which is the substance of an organization includes both that *which is normal* (by whatever test of normalcy is used) and that *which is deviational.* These types should not be equated with the formal-informal classification made by some writers. If, for instance, the "steady-state" principle were to be used as a test of normality and the steady state was observed to deviate from that which would accord with the managerial expectancies, then in that organization the *deviating* behavior would be that *which accorded with managerial expectancies*! The point here is that the true description of the structure of activity systems in an organization must record the deviating as well as normal behavior. Just the fact that deviating behavior takes place, say, in production activities will have an effect,

for instance, upon the steady state of the directing and communicating activities.

4. Finally, the behavior which is the substance of an organization includes both that *which is directed or received inwardly* and that *which is directed toward or received from outside sources.* For example, communicating activity includes both the transmission of data from operating supervisors to the accountants (i.e., *inwardly directed*) and the transmission of reports from the treasurer's office or personnel department to government agencies (i.e., *outwardly directed*). This is equally true of types of behavior other than communicating such as directing, rewarding, penalizing, perpetuating of resources, producing, distributing, etc. It is the inclusion of outwardly-directed behavior which provides the internal structural feature enabling us to study the relationship of the organization to its environment and which indicates the environment as an important determiner of the internal structure of the organization.

It will not be necessary in the discussion of the several classes of activities or activity systems below to refer repeatedly to the properties just named. The behavioral substance of an organization is completely described only when activities manifesting all these properties are included.

Principle for construction of activity classes. By reference to what principle shall we proceed to develop classes of activities which provide for us a useful framework for our concept of the social organization? One could proceed inductively to accumulate observations of people interacting in relation to organizations and then develop categories for classifying these observations according to some common attribute possessed by groups of activities. Fayol (1949), on the basis of a lifetime of practical familiarity with enterprises he managed, did this with a resulting list of "all activities necessary to operating a business." Bales' (1938) list of types of interactions observed in small-group problem-solving apparently is the result of a similar approach. Those who have gathered descriptive data on behavior within and among a number of organizations have found it necessary to develop some such framework of categories consistent with their data, if for no other reason than to organize the presentation of their findings.

Whatever other approach is used, the need for this one will remain in order that any resulting classificatory scheme reflect the phenomena and events of the real world. The question asked is simply, "Are the categories adequate to the meaningful and usable classification of all observed data?" This method, however, does not assure us that the categories developed by the several observers will be comparable. The variety of classificatory schemes testifies to this weakness. Nor does it assure us that the framework itself will suggest dynamic relations among variables leading to the formulation of hypotheses, the testing of which will lead to a cumulative development of systematic theories of organizational behavior.

Another approach is to use the more adequately documented schemes for other types of organization, developed, for instance, for use in mechanics, botany, zoology, or physiology, and use the categories contained therein as, at least, a preliminary framework. This method has great value as a stimulus to systematic thinking, although it is frowned on by scientific purists as providing one with unjustified and misleading analogies.

Another approach which provides a thoroughgoing discipline in systematic thinking is to attempt to derive logically from a set of primitive assumptions about the conditions of survival of an organization and about the nature of human beings who are its agents a minimum number of classes of activities, which necessarily must operate if an organization employing human agents can be said to exist. If successful, such an approach contributes to a concept of organization which is more likely to satisfy some of our criteria with respect to a logical and necessary interdependence among the parts of an organization and between the parts and the whole.

I had a personal experience which introduced me to the value of this approach. Some years ago while Argyris and I were engaged in a critical review of the adequacy of the framework of Bonds of Organization for new research at the Yale Labor and Management Center, he suggested attempting such a logical derivation of the types of activity essential to the existence of an organization (Argyris, 1954). His efforts were very rewarding. From my point of view they helped to sharpen and make more logically consistent the Bonds of Organization framework. From his point of view, the effort resulted in defining a set of Essential Organizational Processes which he has used effectively in his continuing research. The Processes provide a framework of classes of organizational activities which resemble closely, but are not completely identical with, the Bonds of Organization. This is to be expected. One would be somewhat distressed and puzzled if classes of activities found adequate for classifying observed living activities in a large number of organizations were inconsistent with classes of activities logically related to the existence and survival of an organization.

In the elaboration of the concept of organization which follows

I have tried to hold in mind, as a test for that concept, the basic classes of activities found necessary and adequate by researchers who have surveyed the rich and complex variety of organizational activities and attempted to classify them in meaningful ways. The basic structure of the classes of activities and systems of activities is, however, a development of the original framework of Bonds of Organization as modified to be consistent with successive investigations and to contribute to the objective that they should have a necessary and logical functional relation to each other, to the other parts of the organization, and to the whole, and to the power of the organization to survive and fulfill *its* function effectively.

Without assuming that we can make theoretical bricks without empirical straw (an apt word for some of the empirical evidence available), and against the background of efforts made by a large number of social scientists to provide systematic classification for their observations, let us attempt to develop a set of necessary classes of activity systems or Essential Processes characterizing all specific-purpose organizations.

The basic activity requirements of an organization. It will be helpful at this point to have before us once more the general definition of an organization:

> A social organization is a continuing system of differentiated and coordinated human activities utilizing, transforming, and welding together a specific set of human, material, capital, ideational, and natural resources into a unique problem-solving whole whose function is to satisfy particular human needs in interaction with other systems of human activities and resources in its particular environment.

We wish then to determine what activities are necessary to provide dynamic life for such a social organization. What major classes of activities will be required if the organization is to survive, preserve its *unique* wholeness, maintain equilibrium (i.e., a favorable balance of outputs over inputs), develop the energy and the power for efficient operations, and fulfill the function for which it is established?

The following types of activities would appear to be essential in order to attain these objectives in the sense that the attainment is critically imperiled if such activities are performed ineffectively, and is impossible if they are not performed at all. In each of the classes of specific-purpose activities I shall give examples of organizational tasks from the data gathered in connection with the study of the Southern New England Telephone Company (Bakke, 1950).[8] They are, of course, merely illustrative examples of the multitude of organizational tasks which belong to the class named.

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[8] E. Wight Bakke, *Bonds of Organization*, Harper's, New York, 1950, reports this study.

1. Activities to define, make clear, legitimize, and symbolize the image of the unique wholeness of the organization including its function and the main features which distinguish it from other organizations.

We shall call these *Identification Activities.* If effectively carried out, their result is the development of a commonly understood Organizational Charter, its legitimation, and symbolic representation.

> EXAMPLES: Editor of the plant paper writes and publishes an editorial on SNETC service in the hurricane of 1938, indicating it as a reaffirmation of the Company's tradition of service.
>
> A Lineman and a Chief Operator write short stories of their experiences in that storm to accompany the editorial at the request of the Editor.
>
> The President, on the occasion of his retirement, delivers an address on the history and traditions of the company.

The need for such activities arises, first, from the fact that agents of the organization cannot sense from direct experience the whole of the organization, since their relation to many parts is indirect and mediated through the activities of other agents. It arises, second, from the fact that their own self-conceptions, shaped in contact with many organizations, must be modified to make possible their willingness to identify their interests with those of this organization. It arises, third, from the fact that such identification is difficult, if not impossible, without the existence of an image of the organization as a unique whole and an understanding and acceptance of the basic-value premises which justify the existence of the organization, its claims upon them, and their association with it. It arises, finally, from the fact that the organization, in its relations with people and organizations in its environment, finds such relations facilitated by their understanding of its unique wholeness.

A major symptom of ineffectiveness in the carrying out of these activities would be evidences of wide variations, particularly among participants, in perceptions of the central function and distinguishing features of the organization, or of revolution against such central elements in its structure.

2. Activities to acquire, maintain, transform, develop, and renew the basic resources utilized by agents of the organization in the performance of their work for the organization.

We shall call these the *Perpetuation Activities.* If effectively carried out, their result is the availability of all basic resources adequate in quantity and quality for organizational operations.

The need for these activities arises from the fact that resources have a limited utility span, that they are "used up" and must be renewed, and that their inherent and acquired characteristics are developed in response to many factors other than the needs of the organization which acquires and uses them, and must therefore be "transformed" to some degree. The need for their perpetual maintenance in quantity and quality, appropriate to and necessary for their function in the organization, is therefore apparent.

Sub-classes of activities of this sort are defined by reference to the basic resources utilized and by the specific function which the sub-class of activities perpetuates.

(*a*) *Personnel* activities perpetuate People and their qualities.

EXAMPLES: Several newely hired Operators are instructed in certain of their duties by a Chief Operator.

A District Commercial Manager approves the appointment of a new Business Office Supervisor and three new Service Representatives.

Executive Personnel Supervisor directs a training program.

General Plan Personnel Supervisor develops and directs a safety program for Outside-plant people.

(*b*) *Service* activities perpetuate Materials, Equipment, and Plant.

EXAMPLES: Outside-plant crew repairs a break in the line caused by an ice storm.

Testman checks to locate source of a reported failure in service.

Central office Frameman places and terminates certain line connections for new service.

Warehouseman orders requested supplies from Western Electric.

House service force operates the heating system.

(*c*) *Finance* activities perpetuate Capital.

EXAMPLES: President confers with the Comptroller, the Secretary-Treasurer, and General Attorney about a new stock issue.

(*d*) *Thoughtways* activities perpetuate ideas. This involves, for example: research and planning; the development of alternative strategies; the development of policies, methods, rules, standards, etc.; the development and clarification of major premises and bodies of data essential for decisions and action;

the development of an understanding of the nature and potential of the basic material, capital, human, and natural resources; the development and clarification of ideas of all the kinds mentioned in the foregoing section on Ideas; and so forth. Thoughtways are highly important contributors to all of the other Essential Processes.

EXAMPLES: General Manager works on a plan for reallocation of certain functions between Plant and Engineering.

A Foreman of Installers studies the specifications and technical principles back of some new station-equipment and what this implies for the installation process in order to explain these to the Installers.

Traffic Engineer and immediate subordinates undertake a study of equipment requirements in a rapidly growing suburban development.

The Traffic Engineer referred to above consults with Commercial Engineer about market estimates and with General Engineer about equipment developments.

Members of the Wage and Working Practices Committee consider a number of items suggested by a member who has just returned from an A.T. & T. Conference.

General Personnel Supervisor consults with Personnel Supervisors from several departments on standards for recruiting technical employees, and on the revision of several of the personnel policies.

(*e*) *Conservation* activities perpetuate natural resources and access to them, and adapt them to the requirements of other activities.

EXAMPLES: Real Estate Representative negotiates purchase of land required for expansion of facilities.

Outside-plant crew cuts back trees that endanger cables.

A major symptom of ineffectiveness in the carrying out of these Perpetuation activities would be reports of quantitative shortages and qualitative inadequacies in people, materials, equipment, capital, ideas, or natural resources.

A major symptom of inefficiency in the carrying out of these activities is the failure to realize advantageous results in more adequate resources equivalent to the costs involved in the attempt to do so.

3. Activities to create or produce an output, i.e., the product or service satisfying the human need which it is the organization's

function to supply, and to distribute the output advantageously to the continued operation of the organization.

We shall call these the *Work-flow Activities.* If effectively carried out, these activities result in Work and an Output of a quantity and quality adequate to sustain the continued contributions to, and support for, organizational operations by participants and by recipients of the output.

Such activities, arranged in a sequence, constitute the central core of operations or flow of work without which all other activities are meaningless. All activities are interdependent and can be said to be "helper processes" for the others. But the necessary relation of the Work-flow activities to the function of the organization is so immediate, continuous, and essential that in a very real sense it is *the* process to aid which is the principal function of all other activities in the organization. In a very special and necessary sense they are "helper processes" for it.

A chart of the structure of the organization in which the steady state of the work-flow is the central feature is a far better representation of reality than a chart displaying boxes of departmental functions and functionaries and the lines of authority which tie them together.

Sub-classes of activities of this sort are defined by reference to the stages in the work-flow which they occupy. The major sub-classes are:

(*a*) *Production* activities which create or make the output, i.e., the service or product.

EXAMPLES: Traffic operator responds to lights on the board and makes the required connections to facilitate a long-distance call.

(*b*) *Distribution* activities which distribute the product or service to its consumers, often in exchange for that which the organization can employ as an input.

EXAMPLES: District Commercial Manager and an Engineer from Headquarters consult with the manager of a local company on a PBX setup for that company.

A major symptom of ineffectiveness in the carrying on of these activities is an inconsistency between the quantity or quality of the output and the quantity and quality acceptable to the consumers. Other obvious symptoms are interruptions in the flow of work.

A major sign of inefficiency in the carrying out of these activities is the less-than-optimal use of acquired basic resources. Particularly where exchange is involved, another sign of inefficiency is the incurring of total costs for the output which cannot be recovered from the return in inputs stimulated and made possible by its distribution.

4. Activities that assure and control the performance, coordination, and the focusing on the organizational function of all activities carried out by agents and equipment of the organization.

We shall call these the *Control Activities.* If effectively carried out, these activities result in an Administration which unifies and coordinates all differentiated activities toward the performance of the organizational function with a minimum of leakages, i.e., irrelevant or negative activities.

The need for such activities arises because the inherent and acquired characteristics and predispositions of the basic resources (and especially the People) are manifold and multidirectional and are not necessarily oriented toward the performance of the organization's function. Moreover, agents perform differentiated tasks which must be coordinated to provide a smooth, function-fulfilling flow of activities. That coordination requires a systematic and timely flow of information. It is facilitated also by the rating of people and other resources, of their performance, of alternative courses of action, and of results in accordance with criteria and standards appropriate to the kind of judgment required.

A major and general symptom of ineffectiveness in the carrying out of these activities is the occurrence of results disadvantageous, irrelevant, or negative, to the performance of the organizational function.

A major symptom of inefficiency in the carrying out of these activities is the allocation of resources to carrying them out whose value imposes a burden of overhead costs upon the output, making it difficult to distribute that output on terms advantageous to the organization.

Sub-classes of activities of this sort perform the following functions:

(*a*) *Directive activities.* These activities are those which initiate action and the type and direction of action for people and machines. The most important are those which:

(1) Determine the target for performance.
(2) Make known to those from whom performance is desired the details of that performance and the results expected.

(3) Order (or request) and sanction the performance.
(4) Obtain acceptance for, or compliance with the order or request.

Directive activities are normally considered to be initiated by those in the managerial hierarchy at a stage above the actor expected to carry out the directed activity. This is, of course, an important species of directive activity; but we consider as directive activities those that proceed:

Downward in the managerial hierarchy;

EXAMPLES: Foreman of Installers meets with Installers in the morning and assigns to them a list of jobs for the day.

Vice President and General Manager in cooperation with other General Officers determine timing and arrangements for introduction of a new type of service.

Upward in the managerial hierarchy;

EXAMPLES: An Installer asks for clarification of a change in the installation process which is giving trouble and suggests the Foreman take up with the Installation Supervisor a return to the old method.

Laterally among participants at any level;
Diagonally among participants at any levels.

A major symptom of the ineffectiveness of these activities is a failure to have necessary action taken. Another is the failure to obtain acceptance or compliance, partial or complete, with the directive.

(*b*) *Motivation activities.* These activities reward and penalize, or promise rewards or penalties, for behavior in the interest of making it conform to the type desired by the person or persons administering the rewards and penalties.

EXAMPLES: General Accounting Supervisor approves a merit increase for a Staff Assistant.

General Manager commends a District Manager on the reports he has received from customers in the locality served.

District Traffic Manager reprimands a Head Operator for reported failures of service in her exchange.

Foreman recommends discharge of employee for insubordination.

A sign of the ineffectiveness of the carrying out of the motivation activities is behavior varying from the type desired.

(*c*) *Evaluation activities.* Important among these activities are the following:

(1) Supervise performance.
(2) Review, appraise, and rate performance, performers, and results according to standards established.
(3) Assign people (as well as other resources) to positions on scales pertaining to a number of dimensions (such as prestige, importance, power, ability, acceptability, etc.).
(4) Assess the significance of other people, groups, and organizations, and events for the self-realization of the people, groups, or organizations doing the rating.
(5) Compare the relative advantages and costs of alternative courses of action.
(6) Predict probable consequences of alternative courses of action.
(7) Assess the impact of changes in one part of the organization on other parts and the whole.
(8) Assess periodically the state of the whole organization internally and in relation to its environment.

EXAMPLES: Observer prepares periodic report on Operators' performance.

Personnel Supervisor calls Operators together after some difficulty has arisen over the employment of two Negro girls and discusses with them the company policy of no discrimination and the consequent expectancy that employees will not rate each other on the basis of race or religion.

General officers meet to consider reports on a number of key personnel and to evaluate their work during the past year.

A group in General Engineering explore the possibility that some newly available central office equipment would pay for itself.

A major symptom of ineffectiveness in the operation of these activities is the occurrence of results disadvantageous to the organization traceable to mistaken judgment or failure to make a timely judgment.

(*d*) *Communication activities.* These activities are those which *supply* participants with the premises and data they need in order to perform other activities.

Obvious among such premises which need to be supplied are statements of objective or objectives; limits on authority; the position and standing of the actor with respect to others with whom he will be associated and on whom he is dependent for cooperation; expectancies embodied in applicable policies, plans, rules, standards, time requirements, specifications, orders and requests; nature and potential of the resources (human, material, capital, ideational, and natural) to be utilized. Obvious among such data are costs, availability of facilities and resources, alternative strategies and methods, reports and appraisals of past results, forecasts and predictions of probable reactions of others affected by the activity.

It is clear that this type of activity must result in information which flows in a timely manner and in adequate amount both up and down, laterally, and diagonally, as respects the position of the suppliers and recipients of information in the organizational hierarchy.

> EXAMPLES: A foreman prepares and mails a report on an accident that occurred on his crew.
>
> A Traffic Force Engineer sends to the Traffic Manager an estimate of force requirements for Christmas Day.

A major symptom of ineffectiveness in these activities is the necessity for participants to make decisions or take action without knowing what is expected of them, or before the arrival of information, variation in the content of which would necessitate variation in the decision made or the action taken. The ideal toward which the Communication system works is to furnish the right man with adequate, authentic, and authoritative premises and data, at the right place and at the right time, to make possible the activity and results expected of him.

5. Activities which serve to stabilize and vitalize the organization as a whole in an evolving state of dynamic equilibrium.

These activities we shall call the *Homeostatic Activities.* They differ from the specific-purpose activities just named in that they are *combinations* of the other activities. They are *synergic* in character. They therefore add no new *elementary* activities to the concept. One *could* call them simply "synergic" activities and thus avoid the impression of definition by analogy created by the use of the word "homeostatic." The use of this latter word is, however, intended to indicate a very real function necessitated by a continual problem every organization faces. That problem is the maintaining, *in operation,* of an evolving state of dynamic equilibrium consistent with its organizational charter in the face of internal and external conditions and changes in those conditions. These conditions and changes cause strains and stresses within and pressures from without which, if unattended to, can threaten the stability, the integrity, and the viability of the organization. They pose this problem whether they are negative dangers or positive opportunities.

The activities we now are considering are those which marshal and bring into action the other activities in a concerted adaptive effort to maintain the continuing integrity of the organization, integrity with respect to the relationship of its "parts," and integrity with respect to its relations with the external environment.

In order to visualize more specifically the need for these activities, let us review the discussion of the other classes of activities to this point.

The first class of activities we named was the *Identification Activities* which function to produce, legitimize, and symbolize the image of the unique wholeness of the organization.

We then presented three other classes of specific-purpose activities whose functioning is required in order to actualize that image. They function to:

(*a*) *Perpetuate* the basic resources utilized.
(*b*) *Produce* and *Distribute* the need-satisfying product or service it is the function of the organization to supply.
(*c*) *Control* all activities and assure their performance.

The activities of the class we now introduce, as we have already indicated, use and focus all of these activities *in the interest of preserving the unique and dynamic wholeness of the organization,* the development and legitimation of the image of which was the objective of the Identification Activities. They are synergic in that they combine in a cooperative system the other activities to preserve the integrity of the organization in an evolving state of dynamic equilibrium. The requirements for maintaining such a state of equilibrium are that there shall be built-in stimulators and regulators of the activity of any part in such a way that the organization is kept in a steady state of competence to perform its function.

There are at least three synergic processes which can be observed to function in a social organization to fulfill this need:

(*a*) The Fusion process
(*b*) The Problem-solving process
(*c*) The Leadership process

Disintegration in an organization or a decline of homeostasis can result from a failure of any one of these processes.

A. THE FUSION PROCESS

The need for the Fusion Process arises from several facts. Internally an organization is faced with the simultaneous attempt at self-realization and maintenance of the organization, groups of its participants, and individual participants. These attempts are premised on interests and lead to activities which are not always immediately compatible with one another. As we said in the earlier pages of this chapter, these attempts at self-realization lead to any unit of behavior being a response to expectancies generated by all of these sources. For example, the organization attempts to make an agent of the individual and the groups by shaping him and them in its own image for the realization of that image. The group tries to make an agent of the individual and an agency of the organization by shaping him and it in its own image for the realization of that image. The individual tries to make agents of other individuals and agencies of groups and the organization by shaping them in his own image for the realization of that image. This situation presents the organization with a constant threat to its integrity, the more so because the organization finds it necessary from time to time to change its expectancies of groups and individuals, the groups find it necessary to change their expectancies of the organization and individuals, and individuals change their expectancies of both. Moreover, the population of participants changes from time to time and thereby new, unintegrated persons are brought into the organization.

The Fusion Process attempts first of all to reconcile or *fuse* these expectancies and bring them into closer harmony with each other, and in the process the organization, the groups, and the individuals are changed, and their behavior is changed.

The second need for the Fusion Process arises from the fact that the organization as such is related to more comprehensive organizations, and to other autonomous organizations, integration with some of which is essential to its existence. The same dual or multiple directional-process of mutual attempts of one organization to make an agency out of other organizations results in the need for a fusion process as between an organization and others external to or comprehending it.

In other words, the function of the Fusion Process is to maintain the integrity of the organization in the face of divergent interests of individuals, groups, other organizations, and the organization itself, which each hopes to realize through its contact with the other. Its aim is to establish and maintain for the organization an internal and external integration which will at least leave its capacity to perform its function unimpaired, and at best will improve that capacity.

The major symptom of ineffectiveness in the carrying out of this process is the persistence (not necessarily the occurrence) of tensions, friction, and factionalism in the organization, rebellious acts of individuals and groups against activity or standards of activity required of them by the organization, indifference and apathy of participants toward the needs of the organization, lack of interest of participants in defending the organization.[9]

B. THE PROBLEM-SOLVING PROCESS

The need for the Problem-solving Process is so obvious as to need little elaboration. Whether the problem is in the form of a disturbance to, or difficulty in, operations and achievement of results, or in the form of an opportunity for activity which, if adequately exploited, promises advantageous and desirable results, and whether the threat or promise is directed at one or more resources, or at one or more systems of activity, or at the organization as a whole, it calls for the marshaling of the organization's resources and activities and their coordinated combination in a more or less systematic problem-solving process.

Fully recognizing that there are a great variety of ways of problem-solving in an organization, it can be stated, as a generalization from the observation of attempts at the solving of non-routine problems in a number of organizations, that the following steps are normally taken, or a probable result of such a step is "taken for granted" as a foundation for successive steps.[10]

Certain questions are set forth relative to each step which indicate the kind of activity involved. At the same time they furnish a framework of criteria for evaluating the operation of the problem-solving process in any particular case. A negative answer to any of the major questions may indicate the reason for ineffective or inefficient problem-solving.

The steps and the questions pertaining to them are generalizations based on observations of problem-solving of ten going organizations, including those functioning in the business, industrial, public utility, research, governmental, and educational fields.

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[9] A fuller description of The Fusion Process and its relationship to the "status and role concepts" will be found in Bakke, *The Fusion Process*, Yale Labor and Management Center, 1953.

[10] This outline is developed in greater detail in Bakke and Argyris, *Organizational Structure and Dynamics*, Yale Labor and Management Center, 1954, pp. 31 ff.

We assume a stimulus situation has occurred which has a potential impact on the operations and structure of the organization involved. Then follows:

1. *Awareness.* Did the organizational agent or agents responsible for and capable of taking action in situations of this kind become aware of the situation in time to act effectively?
2. *Exploration.* Was adequate and relevant information gathered on the following points to enable responsible agents accurately to judge:

    (*a*) *The Cause* of the situation, e.g.:

    Who is responsible and what are their objectives?

    To what interests and pressures and necessities are they responding?

    What situational factors are responsible; how persistent and powerful are they, and how amenable to modification?

    (*b*) *The Character* of the situation, e.g.:

    Does the situation present the organization with a *threat* or a *promise*, and what are its nature and its dimensions?

    How long has the situation existed, and how long is it likely to continue?

    Who else is affected by the situation, and what are they likely to do about it?

    Does this *intensify* or *minimize* the threat or the promise?

    (*c*) *The Impact* of the situation, e.g.:

    What is failure to meet the situation likely to cost the organization?

    What is meeting the situation likely to gain for the organization?

    The quantity and quality of what basic resources (People, Ideas, Materials, Capital, Nature) are likely to be affected by the situation?

    Is the operation of any of the Essential Processes likely to be affected, and in what way?

What aspects of the Organizational Charter are likely to be affected by the situation, and specifically, is the immediate or long-range integrity of the organization affected?

(*d*) *The Involvements* in solution of the situation, i.e.:

Whose interests will be affected by any attempt at solution?

Who in the organization has a contribution to make toward solving the problem or making a solution difficult?

(*e*) *Placement*, i.e.:

In the area of what Essential Processes is action to meet the situation likely to be required?

What basic functions and objectives of the organization will give direction to any action taken?

Was full information sought from all agents of the organization who are in a position to possess relevant and essential information about the situation?

3. *Structuring.* Were accurate judgments made with respect to the above questions, that is, as to:

(*a*) Who and what is the *cause*?
(*b*) *Character* of the situation as to:
Its being a threat or a promise;
Its duration;
The outsiders affected and their probable actions?
(*c*) *Impact* of the situation on:
Cost of failure to meet it;
Opportunity for gain;
Basic resources;
Essential Processes;
Organizational Charter;
Integrity of the organization?
(*d*) *Involvement* of what people?
(*e*) *Placement* of organizational action in connection with certain Essential Processes directed toward certain organizational functions and objectives?

4. *Simplification.* Was the problem as revealed in the exploration and structuring reduced to, and defined in, terms amenable to practical and effective action?

Was the problem not oversimplified so that significant elements were left unattended to?

5. *Search and Cue.* Were a sufficient number of alternative strategies, or means-end combination of activities suggested?

Were important cues not ignored?

Were all sources of probably significant suggestions as to alternatives explored?

6. *Appraisal of Alternatives.* Were the alternatives carefully appraised as to their probable effectiveness and efficiency in the light of:
   (*a*) The findings from Exploration concerning the cause, character, duration, and impact of the situation?
   (*b*) The organization function to be performed and objectives to be achieved and relevant organization policies?
   (*c*) The quantity and quality of human, ideational, material, capital, and natural resources available?
   (*d*) Particularly, whether the agents who would participate are committed to these objectives; whether their functions as defined are consistent with the activity contemplated; and whether their performance is likely to meet necessary expectancies?
   (*e*) The readiness of the several Essential Processes to deal with the necessary and incidental problems to be encountered?
   (*f*) The anticipated reactions and behavior of those whose interests are affected by the contemplated strategy both inside and outside the organization?

   Were the following calculations relative to possible and probable effects of each alternative strategy accurately made:
   (*a*) The probable gain to the organization related to the immediate objective?
   (*b*) The probable costs (both outlay and opportunity) to the organization?
   (*c*) The possible additional positive or negative consequences not related to the immediate objective including, for example: the effect on future activity of the organization; the power position of the organization; the maintenance of the long-range internal stability and integrity of the organization?

   Did those agents whose functions would be involved in carrying out the strategy have the opportunity to contribute to the appraisal?

7. *Choice and Decision.* Was a choice made of that strategy which, in the light of the Appraisal of Alternatives, promised to produce the greatest net gains? That is, was the probably most efficient strategy chosen?

Was the decision made in time?

Was the decision clean-cut and clear?

Did those whose functions must be called into operation by the chosen strategy concur in the choice and decision?

8. *Mobilization.* Were the objectives to be achieved by the strategy clearly defined and justified?

   Were the plans for operations carefully prepared?

   Were the specifications and standards for activity of the agents involved clearly drawn up?

   Were objectives and their justifications, the plans, the specifications and standards clearly communicated to those involved and was their understanding of these assured?

   Were assignments clearly made and the delegated authority and accountability of each actor specified?

   Was commitment to the objectives and to performance required, motivated, and obtained?

   Were adequate personnel, ideational, material, capital, and natural resources marshaled and made available to the actors?

9. *Response and Action.* Were the necessary activities carried out and controlled, that is, stimulated, directed, coordinated, supervised, regulated, appraised, so as to accomplish the objectives specified in accordance with the plan laid out?

   Were effective modifications made in activities in the light of evolving experience in the process of problem-solving?

10. *Experience and Judgment.* Were results of the effort reviewed and appraisals made as to:
    - (*a*) Attainment or degree of approximation to attainment of organizational, group, and personal objectives?
    - (*b*) Margin of gain over cost to the organization, the group, and individuals?
    - (*c*) Dependability of, and adequacy in quantity and quality of the people, materials, capital, and ideas utilized?
    - (*d*) Increase or decrease in effectiveness of these resources?
    - (*e*) Dependability, effectiveness, and efficiency of the activities related to the several Essential Processes?
    - (*f*) Increase or decrease in effectiveness of these Processes?
    - (*g*) In particular, the dependability, effectiveness, and efficiency of the way the several steps in the Problem-solving

Process were carried out? (See questions for each step as listed above.)

(*h*) Impact of the effort on the maintenance of the integrity of the organization, the groups, and the individuals involved?

Were the effects of the response appraised, and an estimate made of probable future consequences of these effects with respect to the following external factors:

(*a*) People and organizations whose actions have an important impact on the operations of the organization?

(*b*) Potential material, capital, human, ideational, and natural resources?

(*c*) General public reaction to the organization?

Were conclusions drawn as to whether, in the face of a similar situation, the same process would be repeated or certain modifications made?

Did the appraisers become aware of certain incidental stimuli to action growing out of this experience (involving, for example, problems of internal stabilization, modification, or development of, the Organizational Charter, the Basic Resources, or the Essential Processes; or involving problems or opportunities for adaptation in the light of situational factors revealed in the environment)?

11. *Closure or Renewal.* As a result of the Experience and Judgment was:

(*a*) the problem considered solved;

(*b*) a decision made to restructure the problem and renew efforts;

(*c*) a decision made to tackle new problems revealed by the experience in solving this one?

The most obvious symptom of ineffectiveness in the carrying out of these problem-solving activities is the accumulation of recognized but unsolved problems, particularly those which are weakening the ability of the organization to perform its function.

C. LEADERSHIP ACTIVITIES

In defining homeostasis we used the phrase "an evolving state of dynamic equilibrium." Such a concept of the organization's steady state is not the product of a value judgment that an organization *should* grow or evolve as a dynamic whole, but the product of the observation that it *does* grow or evolve because:

(*a*) it operates in a dynamic environment which is constantly making changes necessary in the parts of the organization;

(*b*) such changes in parts impose the necessity for adaptive changes in other parts;
(*c*) such adaptive changes inevitably modify the requirements for cooperative unity and therefore the character of that cooperative unity;
(*d*) the result, unless the organization disintegrates, is that it *does* grow or evolve into a new state of dynamic equilibrium, a new form of the whole.

It would be possible, of course, to conceive of the evolving form of the organization as a product of automatic adaptation to changes in its environment on the part of existing organizational resources and activity systems. But we have generalized from observation of organizations that there is an image of the whole and that this image, as legitimized and symbolized in the Organizational Charter, is a point of reference and orientation in all the activities carried on by agents of the organization. It changes over time, but an interest exists in the maintenance of the integrity of the organization as visualized in that image. We are asserting here that the maintenance of that integrity in the face of the necessity for change is a self-conscious process and not a blind reaction to external forces.

It is this set of circumstances which creates the need in the case of a social organization for some synergic process that provides:

(*a*) the vision or imagination as to developments in the organization or its environment, and as to their significance for parts of the organization, and the organization as a whole;
(*b*) the vision or conception of what this implies as to the characteristics of an evolving whole organization if it is to maintain its integrity and functional effectiveness;
(*c*) the initiative for launching activity which is concerned with developing the organization toward this concept while maintaining its integrity:
(d) a spur and guidance to cooperation of participants in this development.

It will be observed that this process incorporates a number of classes of activities we have already discussed, and focuses them on achieving a homeostasis in the face of the opportunity and necessity for *development and growth.*

Whether one is justified or not in appropriating the word "Leadership" for this process is questionable. The word has been used to label many of the activities we have discussed. Its use will call to the mind of the reader whatever of such content he customarily fills it with. Yet these functions of vision, initiative, encouragement, and guidance with respect to the preservation of the organization as a whole in an evolving state of dynamic equilibrium seem to me to be covered as adequately by no other term.

We have now come the full circle in classifying the activities essential for an organization's survival and its capacity for performance of its function:

(*a*) from the Identification Activities which develop, legitimize, and symbolize the image of the organization;
(*b*) through the Perpetuation, Work-flow, and Control Activities which, so to say, bring that image to life;
(*c*) to those Homeostatic Activities which preserve the integrity of the operating organization (i.e., which actualize that image) in the face of changes required of the whole by changes introduced into the parts as adaptations to internal or external stimuli, and which envision, initiate, and guide its evolving steady state of dynamic equilibrium.

We have one more concept to introduce which relates these activity systems to each other, to other parts of the organization, and to the whole.

Bonds of organization

The elementary substance of a social organization has now been described. It includes:

1. The Organizational Charter.
2. The Basic Resources (People, Ideas, Capital, Materials, Nature).
3. The Essential Processes (Identification, Perpetuation, Work-flow, Control, Homeostatic).

But these elements are related to each other in a state of interdependence. A first approximation to the nature of that interdependence is indicated by the functioning of the homeostatic processes of Fusion, Problem-solving, and Leadership. These processes add no new elements, but utilize and organize and focus the Organizational Charter, the Resources, and the other Processes upon the basic problem of internal adjustment and external adaptation of the organization in such a way that its unique wholeness, its integrity, is maintained in an evolving state of dynamic equilibrium.

The concept of Bonds of Organization is another way of indicating the nature of the interdependence among all the elements. To build up the concept of a Bond of Organization we start with one of the

Essential Processes (say Communication, or Direction), or, to make it simpler, with a particular task incorporated in the activities involved in such a Process. Then we consider the contributions to this Process (or task) made by the Organizational Charter, the Basic Resources, and the other Essential Processes. A description of the Bond would therefore be organized around the following key elements:

1. The *Activity* or behavior involved.
2. The *Function* to be performed or *objective* (which indicates ultimately the contributory relationship of this activity to the function of the organization as defined in the Organizational Charter).
3. The *Instruments* utilized in the activity (which are the specific items of the basic resources needed in carrying on the activity).
   (*a*) People or agents performing the activities
   (*b*) Ideas utilized (Specifications, codes, plans, criteria, premises, bodies of knowledge, etc.)
   (*c*) Materials utilized (Equipment, etc.)
   (*d*) Funds expended
   (*e*) Natural resources
4. The *Helper Processes* (which contribute activities essential to the carrying on of the activity involved).
5. *Reinforcements* (which tend to stabilize and justify the activity usually by means of ritual or sentiments associated with satisfactory relations in connection with, and performance of, the particular activity).

Starting with any particular Process or a constituent activity, therefore, one will, in order to describe it and the variables which impinge upon it, touch upon phenomena associated with every one of the elements of an organization. (Likewise, of course, one might start with any single element in the basic resources and, by indicating the activity in which it was utilized, relate it to all other elements.)

In order to illustrate this let us take a single activity associated with one of the Essential Processes (Downward Direction) and indicate the contribution to its carrying on of all the other elements.

1. *The Activity.* Foreman of a line crew calls employees together at the beginning of the day and assigns to them a list of jobs for the day.
2. *The Function or Objective.* To make sure that the orders for work are processed systematically and that a responsible agent of the company is aware of who is doing what, and the employees know to whom they are accountable.

3. *Instruments:*
    - (*a*) *People*
      Foreman and members of the crew, their individual and collective abilities and predispositions.
    - (*b*) *Ideas and Language*
      Basic principles of technical operations.
      Concept of appropriate procedures.
      Concept of organization and the position of each of the agents involved.
      Concept of appropriate relations between foreman and crew members.
      Concept of criteria, expectancies, and codes applicable to the job.
      Images of each other and themselves held by those involved.
    - (*c*) *Materials*
      Truck, supplies, tools, and paper forms.
    - (*d*) *Funds*
      Budgeted amount available for this type of activity.
    - (*e*) *Natural resources*
      Weather
4. *Helper Processes:*
    - (*a*) *Identification Process*
      Has provided an over-all sense of the significance of the job they are asked to do and the spirit in which it is to be done. Also has established the fact that at this point the Foreman stands for the company. Has also built up a concept of the work group and its significance and character.
    - (*b*) *Work-flow Processes*
      Has provided the necessities of operating effectiveness which govern the kinds of directions that are given.
    - (*c*) *Perpetuation Processes*
        - (1) *Thoughtways*
          Has provided the ideational instruments named above under 3*b*.
        - (2) *Personnel*
          Has supplied the people in the crew, and trained and developed their abilities appropriate to the task at hand.
        - (3) *Services*
          Has supplied in the quantity and quality needed the material instruments named above under 3*c*.

(4) *Finance*

Has supplied the capital requirements essential to the whole company's operation of which this is a part.

(5) *Conservation*

Not immediately relevant.

(*d*) *Control Processes*

(1) *Direction (downward)*

Has through practice established a routine of initiation and response, of authority, accountability, and compliance which is taken for granted.

Direction (upward)

Has through practice established a tolerance for requests and demands for clarification and help from Foreman which encourages acceptance of his orders.

(2) *Motivation*

Has through practice established a set of expectancies as to rewards for competent performance and penalties for failure to follow instructions or for objecting to assignments.

(3) *Evaluation*

Has in recurrent practice made both foremen and crew members aware of standards of performance which they are expected to attain.

Has established a relative prestige and competence rating between foremen and crew members.

(4) *Communication*

Has through practice established this pattern of oral and written instructions and feedback questions and comments.

(*e*) *Reinforcements*

Daily ritual of the job assignment meeting—

Sentiments:

"Our foreman is a right guy."

"I can count on this gang."

Conclusion

The description of a social organization utilizing as a framework the Bonds of Organization focuses attention, therefore, on activity as the basic stuff of organization, activity carried on:

(*a*) to develop and legitimize an organizational charter including the organization's function and objective;
(*b*) to provide and perpetuate the basic resources required;
(*c*) to produce a product or service;
(*d*) to control and coordinate all operations and behavior;
(*e*) to provide for ability, viability, and integrity of the organization in a state of evolving dynamic equilibrium.

Furthermore, such a description necessarily involves relating such activity to the material, capital, human, ideational, and natural resources which it utilizes and which, so to say, it welds together in a dynamic relationship, and ultimately into an evolving whole.

When it is recalled that the activities must necessarily:

(*a*) accord with a fusion of organizational, group, and personal expectancies;
(*b*) be those both of initiation and response;
(*c*) include both normal and deviational behavior; and
(*d*) include both outwardly and inwardly directed behavior,

it will be seen that the description of any organization in accordance with this concept of organization is no easy task. But it would nevertheless be a systematic task. Had one the desire to do so, he could start with a single group of say, Communication Activities, and in tracing the variables to which they were related, and which affect and are affected by them, would find himself eventually in touch with every major class of parts of the whole organization.

It may be asserted that this is a highly theoretical and complicated concept. There will be those who feel that a concept, whether for the practical uses of research or of operations, must be uncomplicated, and that the variables named should be as simple and few as possible. One may agree with this emphasis and at the same time differ with his critics as to the interpretation of the phrase, "as possible."

But a practical definition of variables is not necessarily a simple definition, especially when any particular variable performs a function in relation to, or in cooperation with, a large number of interrelated variables, and its effects are as dependent upon those interrelationships as upon its own inherent characteristics. It may be possible in laboratory experiments to ignore or hold constant these other interrelated variables. But, in the end, the findings of all types of organizational research will have to be integrated with the system of variables which actually exists in a living organization with all of its complexity.

In defining an adequate and usable concept of the social organization, I am not nearly so impressed by the impracticality involved in magnitude and complexity as by that inherent in oversimplification.

Framework of Bonds of Organization

Identification Bond

Developing, legitimizing, and symbolizing
The Organizational Charter

Perpetuation Bonds

Acquiring, maintaining, transforming, and developing
Basic Resources

Thoughtways *Personnel* *Services* *Finance* *Conservation*

Work-flow Bonds

Producing and distributing
the Output

Production *Distribution*

Control Bonds

Directing, coordinating, stimulating, regulating, appraising
all Operations

Direction *Motivation* *Evaluation* *Communication*

Homeostatic Bonds

Preserving integrity of organization in an
evolving state of dynamic equilibrium

Fusion *Leadership* *Problem-solving*

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A Behavioral Theory of Organizational Objectives

ORGANIZATIONS MAKE DECISIONS. THEY MAKE DECISIONS IN THE same sense in which individuals make decisions: The organization as a whole behaves as though there existed a central coordination and control system capable of directing the behavior of the members of the organization sufficiently to allow the meaningful imputation of purpose to the total system. Because the central nervous system of most organizations appears to be somewhat different from that of the individual system, we are understandably cautious about viewing organization decision-making in quite the same terms as those applied to individual choice. Nevertheless, organizational choice is a legitimate and important focus of research attention.

As in theories of individual choice, theories of organizational deci-

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The research is supported by grants from the Graduate School of Industrial Administration, Carnegie Institute of Technology, from the school's funds and from Ford Foundation funds, given for the study of organizational behavior.

sion-making fall into two broad classes. Normative theorists—particularly economic theorists of the firm—have been dedicated to the improvement of the rationality of organizational choice. Recent developments in the application of mathematics to the solution of economic decision-problems are fully and effectively in such a tradition (Cooper, Hitch, Baumol, Shubik, Schelling, Valavanis, and Ellsberg, 1958). The empirical theory of organizational decision-making has a much more checkered tradition and is considerably less well-developed (March and Simon, 1958).

The present efforts to develop a behavioral theory of organizational decision-making represent attempts to overcome the disparity between the importance of decision-making in organizations and our understanding of how, in fact, such decisions are made. The research as a whole, as well as that part of it discussed below, is based on three initial commitments. The first of these is to develop an explicitly empirical theory rather than a normative one. Our interest is in understanding how complex organizations make decisions, not how they ought to do so. Without denying the importance of normative theory, we are convinced that the major current needs are for empirical knowledge.

The second commitment is to focus on the classic problems long explored in economic theory—pricing, resource allocation, and capital investment. This commitment is intended to overcome some difficulties with existing organization theory. By introducing organizational propositions into models of rather complex systems, we are driven to increase the precision of the propositions considerably. At present, anyone taking existing organization theory as a base for predicting behavior within organizations finds that he can make a number of rather important predictions of the general form: If x varies, y will vary. Only rarely will he find either the parameters of the functions or more elaborate predictions for situations in which the *ceteris paribus* assumptions are not met.

The third commitment is to approximate in the theory the process by which decisions are made by organizations. This commitment to a process-oriented theory is not new. It has typified many organization theorists in the past (Marshall, 1919; Weber, 1947). The sentiment that one should substitute observation for assumption whenever possible seems, *a priori,* reasonable. Traditionally, the major dilemma in organization theory has been between putting into the theory all the features of organizations we think are relevant and thereby making the theory unmanageable, or pruning the model down to a simple system, thereby making it unrealistic. So long as we had to deal primarily with classical mathematics, there was, in fact, little we could do. With the advent of the computer and the use of simulation, we have a methodology that will permit us to expand considerably the emphasis on actual process without losing the predictive precision essential to testing (Cyert and March, in press, 1959).

In models currently being developed there are four major sub systems. Since they operate more or less independently, it is possible to conceive them as the four basic sub-theories required for a behavioral theory of organizational decision-making: first, the theory of organizational objectives; second, the theory of organizational expectations; third, the theory of organizational choice; fourth, the theory of organizational implementation. In this paper we discuss the first of these only, the theory of organizational objectives.

The Organization as a Coalition

Let us conceive the organization as a coalition. It is a coalition of individuals, some of them organized into sub-coalitions. In the business organization, one immediately thinks of such coalition members as managers, workers, stockholders, suppliers, customers, lawyers, tax collectors, etc. In the governmental organization, one thinks of such members as administrators, workers, appointive officials, elective officials, legislators, judges, clientele, etc. In the voluntary charitable organization, one thinks of paid functionaries, volunteers, donors, donees, etc.

This view of an organization as a coalition suggests, of course, several different recent treatments of organization theory in which a similar basic position is adopted. In particular, inducements-contributions theory (Barnard, 1938; Simon, 1947), theory of games (von Neumann and Morgenstern, 1947), and theory of teams (Marschak, in this volume). Each of these theories is substantially equivalent on this score. Each specifies:

1. That organizations include individual participants with (at least potentially) widely varying preference orderings.
2. That through bargaining and side payments the participants in the organization enter into a coalition agreement for purposes of the game. This agreement specifies a joint preference-ordering (or organizational objective) for the coalition.
3. That thereafter the coalition can be treated as a single strategist, entrepreneur, or what have you.

Such a formulation permits us to move immediately to modern decision theory, which has been an important part of recent developments in normative organization theory. In our view, however, a joint preference ordering is not a particularly good description of actual organization goals. Studies of organizational objectives suggest that to the extent to which there is agreement on objectives, it is agreement on highly ambiguous goals (Truman, 1951; Kaplan, Dirlam, and Lanzillotti, 1958). Such agreement is undoubtedly important to choice within the organization, but it is a far cry from a clear preference ordering. The studies suggest further that behind this agreement on rather vague objectives there is considerable disagreement and uncertainty about sub-goals; that organizations appear to be pursuing one goal at one time and another (partially inconsistent) goal at another; and that different parts of the organization appear to be pursuing different goals at the same time (Kaplan, Dirlam, and Lanzillotti, 1958; Selznick, 1949). Finally, the studies suggest that most organization objectives take the form of an aspiration level rather than an imperative to "maximize" or "minimize," and that the aspiration level changes in response to experience (Blau, 1955; Alt, 1949).

In the theory to be outlined here, we consider three major ways in which the objectives of a coalition are determined. The first of these is the bargaining process by which the composition and general terms of the coalition are fixed. The second is the internal organizational process of control by which objectives are stabilized and elaborated. The third is the process of adjustment to experience, by which coalition agreements are altered in response to environmental changes. Each of these processes is considered, in turn, in the next three sections of the paper.

Formation of Coalition Objectives through Bargaining

A basic problem in developing a theory of coalition formation is the problem of handling side payments. No matter how we try, we simply cannot imagine that the side payments by which organizational coalitions are formed even remotely satisfy the requirements of unrestricted transferability of utility. Side payments are made in many forms: money, personal treatment, authority, organization policy, etc. A winning coalition does not have a fixed booty which it then divides among its members. Quite to the contrary, the total value of side payments available for division among coalition members is a function of the composition of the coalition; and the total utility of the actual side payments depends on the distribution made within the coalition. There is no conservation of utility.

For example, if we can imagine a situation in which any dyad is a viable coalition (e.g., a partnership to exploit the proposition that two can live more cheaply in coalition than separately), we would predict a greater total utility for those dyads in which needs were complementary than for those in which they were competitive. Generally speaking, therefore, the partitioning of the adult population into male-female dyads is probably more efficient from the point of view of total utility accruing to the coalition than is a partition into sexually homogeneous pairs.

Such a situation makes game theory as it currently exists virtually irrelevant for a treatment of organizational side payments (Luce and Raiffa, 1957). But the problem is in part even deeper than that. The second requirement of such theories as game theory, theory of teams, and inducements-contributions theory, is that after the side payments are made, a joint preference ordering is defined. All conflict is settled by the side-payment bargaining. The employment-contract form of these theories, for example, assumes that the entrepreneur has an objective. He then purchases whatever services he needs to achieve the objective. In return for such payments, employees contract to perform whatever is required of them—at least within the range of permissible requirements. For a price, the employee adopts the "organization" goal.

One strange feature of such a conception is that it describes a coalition asymmetrically. To what extent is it arbitrary that we call wage payments "costs" and dividend payments "profits"—rather than the other way around? Why is it that in our quasi-genetic moments we are inclined to say that in the beginning there was a manager and he recruited workers and capital? For the development of our own theory we make two major arguments. First, the emphasis on the asymmetry has seriously confused our understanding of organizational goals. The confusion arises because ultimately it makes only slightly more sense to say that the goal of a business organization is to maximize profit than it does to say that its goal is to maximize the salary of Sam Smith, Assistant to the Janitor.

Second, despite this there are important reasons for viewing some coalition members as quite different from others. For example, it is clear that employees and management make somewhat different demands on the organization. In their bargaining, side payments appear traditionally to have performed the classical function of specifying a joint preference ordering. In addition, some coalition members (e.g., many stockholders) devote substantially less time to the particular coalition under consideration than do others. It is this characteristic that has usually been used to draw organizational boundaries between "external" and "internal" members of the coalition. Thus, there are important classes of coalition members who are passive most of the time. A condition of such passivity must be that the payment demands they make are of such a character that most of the time they can be met rather easily.

Although we thereby reduce substantially the size and complexity of the coalition relevant for most goal-setting, we are still left with something more complicated than an individual entrepreneur. It is primarily through bargaining within this active group that what we call organizational objectives arise. Side payments, far from being incidental distribution of a fixed, transferable booty, represent the central process of goal specification. That is, a significant number of these payments are in the form of policy commitments.

The distinction between demands for monetary side payments and demands for policy commitments seems to underlie management-oriented treatments of organizations. It is clear that in many organizations this distinction has important ideological and therefore affective connotations. Indeed, the breakdown of the distinction in our generation has been quite consistently violent. Political party-machines in this country have changed drastically the ratio of direct monetary side payments (e.g., patronage, charity) to policy commitments (e.g., economic legislation). Labor unions are conspicuously entering into what has been viewed traditionally as the management prerogatives of policy-making, and demanding payments in that area. Military forces have long since given up the substance—if not entirely the pretense—of being simply hired agents of the regime. The phenomenon is especially obvious in public (Dahl and Lindblom, 1953; Simon, Smithburg, and Thompson, 1950) and voluntary (Sills, 1957; Messinger, 1955) organizations; but all organizations use policy side payments. The marginal cost to other coalition members is typically quite small.

This trend toward policy side payments is particularly observable in contemporary organizations, but the important point is that we have never come close to maintenance of a sharp distinction in the kinds of payments made and demanded. Policy commitments have (one is tempted to say always) been an important part of the method by which coalitions are formed. In fact, an organization that does not use such devices can exist in only a rather special environment.

To illustrate coalition formation under conditions where the problem is not scarce resources for side payments, but varying complementarities of policy demands, imagine a nine-man committee appointed to commission a painting for the village hall. The nine members make individually the following demands:

Committeeman A: The painting must be an abstract monotone.
Committeeman B: The painting must be an impressionistic oil.
Committeeman C: The painting must be small and oval in shape.
Committeeman D: The painting must be small and in oil.
Committeeman E: The painting must be square in shape and multicolored:
Committeeman F: The painting must be an impressionistic square.
Committeeman G: The painting must be a monotone and in oil.
Committeeman H: The painting must be multicolored and impressionistic.
Committeeman I: The painting must be small and oval.

In this case, each potential coalition member makes two simple demands. Assuming that five members are all that are required to make the decision, there are three feasible coalitions. A, C, D, G, and I can form a coalition and commission a small, oval, monotone, oil abstract. B, C, D, H, and I can form a coalition and commission a small, oval, multicolored, impressionistic oil. B, D, E, F, and H can form a coalition and commission a small, square, multicolored, impressionistic oil.

Committeeman D, it will be noted, is in the admirable position of being included in every possible coalition. The reason is clear; his demands are completely consistent with the demands of everyone else.

Obviously at some level of generality the distinction between money and policy payments disappears because any side payment can be viewed as a policy constraint. When we agree to pay someone $35,000 a year, we are constrained to that set of policy decisions that will allow such a payment. Any allocation of scarce resources (such as money) limits the alternatives for the organization. But the scarcity of resources is not the only kind of problem. Some policy demands are strictly inconsistent with other demands. Others are completely complementary. If I demand of the organization that John Jones be shot and you demand that he be sainted, it will be difficult for us both to stay in the organization. This is not because either bullets or haloes are in short supply or because we don't have enough money for both.

To be sure, the problems of policy consistency are *in principle* amenable to explicit optimizing behavior. But they add to the computational difficulties facing the coalition members and make it even more obvious why the bargaining leading to side payment and policy agreements is only slightly related to the bargaining anticipated in a theory of omniscient rationality. The tests of short-run feasibility that they represent lead to the familiar complications of conflict, disagreement, and rebargaining.

In the process of bargaining over side payments many of the organizational objectives are defined. Because of the form the bargaining takes, the objectives tend to have several important attributes. First, they are imperfectly rationalized. Depending on the skill of the leaders involved, the sequence of demands leading to the new bargaining, the aggressiveness of various parts of the organization, and the scarcity of resources, the new demands will be tested for consistency with existing policy. But this testing is normally far from complete. Second, some objectives are stated in the form of aspiration-level constraints. Objectives arise in this form when demands which are consistent with the coalition are stated in this form. For example, the demand, "We must allocate ten percent of our total budget to research." Third, some objectives are stated in a non-operational form. In our formulation such objectives arise when potential coalition members have demands which are non-operational or demands which can be made non-operational. The prevalence of objectives in this form can be explained by the fact that non-operational objectives are consistent with virtually any set of objectives.

Stabilization and Elaboration of Objectives

The bargaining process goes on more or less continuously, turning out a long series of commitments. But a description of goal formation simply in such terms is not adequate. Organizational objectives are, first of all, much more stable than would be suggested by such a model, and secondly, such a model does not handle very well the elaboration and clarification of goals through day-to-day bargaining.

Central to an understanding of these phenomena is again an appreciation for the limitations of human capacities and time to devote to any particular aspect of the organizational system. Let us return to our conception of a coalition having monetary and policy side payments. These side-payment agreements are incomplete. They do not anticipate effectively all possible future situations, and they do not identify all considerations that might be viewed as important by the coalition members at some future time. Nevertheless, the coalition members are motivated to operate under the agreements and to develop some mutual control-systems for enforcing them.

One such mutual control-system in many organizations is the budget. A budget is a highly explicit elaboration of previous commitments. Although it is usually viewed as an asymmetric control-device (i.e., a means for superiors to control subordinates), it is clear that it represents a form of mutual control. Just as there are usually severe costs to the department in exceeding the budget, so also are there severe costs to other members of the coalition if the budget is not paid in full. As a result, budgets in every organization tend to be self-confirming.

A second major, mutual control-system is the allocation of functions. Division of labor and specialization are commonly treated in management textbooks simply as techniques of rational organization. If, however, we consider the allocation of functions in much the way we would normally view the allocation of resources during budgeting, a somewhat different picture emerges. When we define the limits of discretion, we constrain the individual or sub-group from acting outside those limits. But at the same time, we constrain any other members of the coalition from prohibiting action within those limits. Like the allocation of resources in a budget, the allocation of discretion in an organization chart is largely self-confirming.

The secondary bargaining involved in such mutual control-systems serves to elaborate and revise the coalition agreements made on entry (Thompson and McEwen, 1958). In the early life of an organization, or after some exceptionally drastic organizational upheaval, this elaboration occurs in a context where very little is taken as given. Relatively deliberate action must be taken on everything from pricing policy to paper-clip policy. Reports from individuals who have lived through such early stages emphasize the lack of structure that typifies settings for day-to-day decisions (Simon, 1953).

In most organizations most of the time, however, the elaboration of objectives occurs within much tighter constraints. Much of the situation is taken as given. This is true primarily because organizations have memories in the form of precedents, and individuals in the coalition are strongly motivated to accept the precedents as binding. Whether precedents are formalized in the shape of an official standard-operating-procedure or are less formally stored, they remove from conscious consideration many agreements, decisions, and commitments that might well be subject to renegotiation in an organization without a memory (Cyert and March, to be published, 1960). Past bargains become precedents for present situations. A budget becomes a precedent for future budgets. An allocation of functions becomes a precedent for future allocations. Through all the well-known mechanisms, the coalition agreements of today are institutionalized into semipermanent arrangements. A number of administrative aphorisms come to mind: an unfilled position disappears; see an empty office and fill it up; there is nothing temporary under the sun. As a result of organizational precedents, objectives exhibit much greater stability than would typify a pure bargaining situation. The "accidents" of organizational genealogy tend to be perpetuated.

Changes in Objectives through Experience

Although considerably stabilized by memory and institutionalization-phenomena, the demands made on the coalition by individual members do change with experience. Both the nature of the demands and their quantitative level vary over time.

Since many of the requirements specified by individual participants are in the form of attainable goals rather than general maximizing constraints, objectives are subject to the usual phenomena associated with aspiration levels. As an approximation to the aspiration-level model, we can take the following set of propositions:

1. In the steady state, aspiration level exceeds achievement by a small amount.
2. Where achievement increases at an increasing rate, aspiration level will exhibit short-run lags behind achievement.
3. Where achievement decreases, aspiration level will be substantially above achievement.

These propositions derive from simpler assumptions requiring that current aspiration be an optimistic extrapolation of past achievement and past aspiration. Although such assumptions are sometimes inappropriate, the model seems to be consistent with a wide range of human goal-setting behavior (Lewin, Dembo, Festinger, and Sears, 1944). Two kinds of achievement are, of course, important. The first is the achievement of the participant himself. The second is the achievement of others in his reference group (Festinger, 1954).

Because of these phenomena, our theory of organizational objectives must allow for drift in the demands of members of the organization. No one doubts that aspirations with respect to monetary compensation vary substantially as a function of payments received. So also do aspirations regarding advertising budget, quality of product, volume of sales, product mix, and capital investment. Obviously, until we know a great deal more than we do about the parameters of the relation between achievement and aspiration we can make only relatively weak predictions. But some of these predictions are quite useful, particularly in conjunction with search theory (Cyert, Dill, and March, 1958).

For example, two situations are particularly intriguing. What happens when the rate of improvement in the environment is great enough so that it outruns the upward adjustment of aspiration? Second, what happens when the environment becomes less favorable? The general answer to both of these questions involves the concept of organizational slack (Cyert and March, 1956). When the environment outruns aspiration-level adjustment, the organization secures, or at least has the potentiality of securing, resources in excess of its demands. Some of these resources are simply not obtained—although they are available. Others are used to meet the revised demands of those members of the coalition whose demands adjust most rapidly—usually those most deeply involved in the organization. The excess resources would not be subject to very general bargaining because they do not involve allocation in the face of scarcity. Coincidentally perhaps, the absorption of excess resources also serves to delay aspiration-level adjustment by passive members of the coalition.

When the environment becomes less favorable, organizational slack represents a cushion. Resource scarcity brings on renewed bargaining and tends to cut heavily into the excess payments introduced during plusher times. It does not necessarily mean that precisely those demands that grew abnormally during better days are pruned abnormally during poorer ones; but in general we would expect this to be approximately the case.

Some attempts have been made to use these very simple propositions to generate some meaningful empirical predictions. Thus, we predict that, discounting for the economies of scale, relatively successful firms will have higher unit-costs than relatively unsuccessful ones. We predict that advertising expenditures will be a function of sales in the previous time period at least as much as the reverse will be true.

The nature of the demands also changes with experience in another way. We do not conceive that individual members of the coalition will have a simple listing of demands, with only the quantitative values changing over time. Instead we imagine each member as having a rather disorganized file case full of demands. At any point in time, the member attends to only a rather small subset of his demands, the number and variety depending again on the extent of his involvement in the organization and on the demands of his other commitments on his attention.

Since not all demands are attended to at the same time, one important part of the theory of organizational objectives is to predict when particular units in the organization will attend to particular goals. Consider the safety goal in a large corporation. For the safety engineers, this is a very important goal most of the time. Other parts of the organization rarely even consider it. If, however, the organization has some drastic experience (e.g., a multiple fatality), attention to a safety goal is much more widespread and safety action quite probable.

Whatever the experience, it shifts the attention-focus. In some (as in the safety example), adverse experience suggests a problem area to be attacked. In others, solutions to problems stimulate attention to a particular goal. An organization with an active personnel-research department will devote substantial attention to personnel goals not because it is necessarily a particularly pressing problem but because the sub-unit keeps generating solutions that remind other members of the organization of a particular set of objectives they profess.

The notion of attention-focus suggests one reason why organizations are successful in surviving with a large set of unrationalized goals. They rarely see the conflicting objectives simultaneously. For example, let us reconsider the case of the pair of demands that John Jones be either (*a*) shot or (*b*) sainted. Quite naturally, these were described as inconsistent demands. Jones cannot be simultaneously shot and sainted. But the emphasis should be on *simultaneously*. It is quite feasible for him to be first shot and then sainted, or vice versa. It is logically feasible because a halo can be attached as firmly to a dead man as to a live one and a saint is as susceptible to bullets as a sinner. It is organizationally feasible because the probability is low that both of these demands will be attended to simultaneously.

The sequential attention to goals is a simple mechanism. A consequence of the mechanism is that organizations ignore many conditions that outside observers see as direct contradictions. They are contradictions only if we imagine a well-established, joint preference ordering or omniscient bargaining. Neither condition exists in an organization. If we assume that attention to goals is limited, we can explain the absence of any strong pressure to resolve apparent internal inconsistencies. This is not to argue that all conflicts involving objectives can be resolved in this way, but it is one important mechanism that deserves much more intensive study.

Constructing a Predictive Theory

Before the general considerations outlined above can be transformed into a useful predictive theory, a considerable amount of precision must be added. The introduction of precision depends, in turn, on the future success of research into the process of coalition formation. Nevertheless, some steps can be taken now to develop the theory. In particular, we can specify a general framework for a theory and indicate its needs for further development.

We assume a set of coalition members, actual or potential. Whether these members are individuals or groups of individuals is unimportant. Some of the possible subsets drawn from this set are viable coalitions. That is, we will identify a class of combinations of members such that any of these combinations meet the minimal standards imposed by the external environment on the organization. Patently, therefore, the composition of the viable set of coalitions will depend on environmental conditions.

For each of the potential coalition members we require a set of demands. Each such individual set is partitioned into an active part currently attended to and an inactive part currently ignored. Each demand can be characterized by two factors: first, its marginal resource requirements, given the demands of all possible other combinations of demands from potential coalition members; second, its marginal consistency with all possible combinations of demands from potential coalition members.

For each potential coalition member we also require a set of problems, partitioned similarly into an active and an inactive part.

This provides us with the framework of the theory. In addition, we need five basic mechanisms. First, we need a mechanism that changes the quantitative value of the demands over time. In our formulation, this becomes a version of the basic aspiration-level and mutual control theory outlined earlier.

Second, we need an attention-focus mechanism that transfers demands among the three possible states: active set, inactive set, not-considered set. We have said that some organizational participants will attend to more demands than other participants and that for all participants some demands will be considered at one time and others at other times. But we know rather little about the actual mechanisms that control this attention factor.

Third, we need a similar attention-focus mechanism for problems. As we have noted, there is a major interaction between what problems are attended to and what demands are attended to, but research is also badly needed in this area.

Fourth, we need a demand-evaluation procedure that is consistent with the limited capacities of human beings. Such a procedure must specify how demands are checked for consistency and for their resource demands. Presumably, such a mechanism will depend heavily on a rule that much of the problem is taken as given and only incremental changes are considered.

Fifth, we need a mechanism for choosing among the potentially viable coalitions. In our judgment, this mechanism will probably look much like the recent suggestions of game theorists that only small changes are evaluated at a time (Luce and Raiffa, 1957).

Given these five mechanisms and some way of expressing environmental resources, we can describe a process for the determination of objectives in an organization that will exhibit the important attributes of organizational goal-determination. At the moment, we can approximate some of the required functions. For example, it has been possible to introduce into a complete model a substantial part of the first mechanism, and some elements of the second, third, and fourth (Cyert, Feigenbaum, and March, 1959). Before the theory can develop further, however, and particularly before it can focus intensively on the formation of objectives through bargaining and coalition formation (rather than on the revision of such objectives and the selective attention to them), we require greater empirical clarification of the phenomena involved.

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ANATOL RAPOPORT

4.

A Logical Task as a Research Tool in Organization Theory

Introduction

THE STUDY OF ORGANIZATION CAN BE APPROACHED EXPERIMENTALLY, if the essentials of organized activity can be reproduced in a situation subjected to controlled manipulation and to detailed scrutiny. We will begin by listing some desired features of such a situation.

1. There should be a task whose performance can be evaluated in objective or quantitative terms.
2. Preferably there should be more than one criterion of evaluation.
3. Attempts to optimize performance on some criterion should conflict with attempts to optimize it on others.
4. There should be a division of labor among the members of the team confronted with the task.

5. The performance of the various sub-teams should depend on the performance of other sub-teams.
6. Communication should go on among the members of the sub-teams.
7. There should be criteria for evaluating the communication.

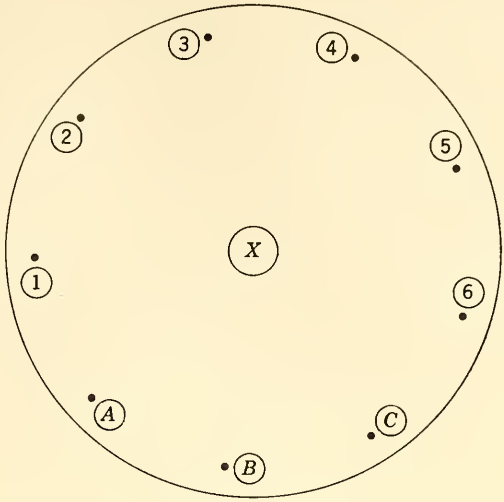
Once the task has been chosen, experiments related to this task can now proceed along several lines.

1. The task can be treated as an independent variable. For example, the performance of the team can be studied on a series of tasks of varying complexity or in situations with different rates of input (as in "overload" studies). The observed changes of both performance and of group organization (including shifting leadership) will then constitute the dependent variable.
2. The goals can be treated as an independent variable. For example, the different criteria of performance can be assigned different weights. The dependent variables would be the same as above.
3. The form of organization can be treated as an independent variable. For example, the lines of authority and communication can be imposed on the group. Then the performance, and perhaps the goals, would be the dependent variables.

Many specific questions can be subsumed under this scheme. For example, to what extent (say, how quickly or how surely) does a shift in goals influence the selection of leaders with appropriate qualifications? If the goals or the stress (say, the rate of input or the difficulty of the task) change, what is more likely to happen first (if appropriate adjustments are made), a reshuffling of personnel in the existing organization structure, or a change in structure? If the latter occurs first, will *de facto* changes usually precede *de jure* changes? If so, what lag can be expected? Under what conditions will *de jure* changes alone take place, the *de facto* structure remaining the same?

In what follows, we will describe only a very small part of this program as it has been pursued at the Mental Health Research Institute. The experimental work and the analysis described in Section I have been largely completed. But the most interesting part from the point of view of organization theory, the experiments described in Section II, are still on the drawing boards. Nevertheless we think it is worthwhile to present this part of the program, if only in its planning stage, because it does illustrate an experimental approach to organization theory along the lines indicated above.

Figure 1



The Task under Different Experimental Conditions

We will first describe the apparatus and the task. It is suited both to individual and group performance. In the preliminary experiments to be described, the task was solved cooperatively by three-person groups, but organization theory played hardly any part in our evaluation of the experiment, since we were concentrating on studying the task itself and the various criteria of performance which promised to be of relevance. The study of organization will enter only the next phase of the program, not yet carried out, which here will be described as it has been designed.

The task is performed on the so-called Ψ apparatus.[1] It has been described in detail elsewhere,[2] and we will here confine ourselves to the bare essentials.

The subject is faced with a circular disc with nine lights on the periphery and one at the center, labeled as shown in Figure 1.

[1] The Greek letter is an abbreviation for PSI, which is itself an abbreviation for Problem-Solving Instrument, the name given to an electronically operated apparatus developed in Chicago by E. R. John, J. G. Miller, S. Molnar, and H. J. A. Rimoldi.

[2] *Cf.* E. R. John and J. G. Miller, "The Acquisition and Application of Information in the Problem-Solving Process: An Electronically Operated Logical Test," *Behavioral Science,* 2, 291–300 (1957); A. Rapoport, "Quantification of Performance in a Logical Task With Uncertainty," *Symposium on Information Theory in Biology* (H. P. Yockey, ed.), Pergamon Press, New York, 1958.

Each light except *X* may be lit by pressing the button next to it, shown in black. However, time is divided into alternating periods, *Even* and *Odd*. Some of the lights can be lit only in an even period, some only in an odd one. (Whether the number designating the light is even or odd has nothing to do with this.) Thus if light No. 1 can be activated only in an even period, and I press its adjoining button in an odd period, No. 1 will not light, unless I hold the button down until the onset of the even period. On some machines, the periods are of 3-second duration; on others, of 5 seconds.

Suppose a light, say No. 1, is lit by pressing the button next to it in the appropriate period. It may happen that the light so "activated" will, in turn, activate another light or lights in the period immediately following and so on, so that different subsets of lights will be lit in the successive time periods. In other words, "causal relations" exist between some lights and others. These relations may be of three kinds:

1. *Full cause.* If, whenever No. 1 is activated, No. 2 will be activated in the next period, No. 1 is said to be a full cause of No. 2.
2. *Partial cause.* If neither the activation of No. 1 nor of No. 3 is sufficient to activate No. 2 in the next time period, but the *simultaneous* activation of both No. 1 and No. 3 will activate No. 2 in the next time period, then No. 1 and No. 3 are called partial causes of No. 2. Generalization to more than two partial causes is obvious.
3. *Inhibition.* Suppose the activation of No. 1 *prevents* the activation of No. 2 in the next time period, regardless of what other lights are activated simultaneously with No. 1 (among which may be full causes or sufficient combinations of partial causes). Then No. 1 will be called an inhibitor of No. 2.

Whenever one of these three causal relations exists between two lights, it is indicated on the disc by an arrow leading from the full or partial cause or inhibitor to the light affected. The presence of the arrow insures the operation of one kind of causal relation. If only one arrow connects two lights, it can mean only full cause, since otherwise the presence or absence of the arrow would be immaterial. But if two or more arrows converge on a light, their meaning is *a priori* ambiguous. Each pattern or network of causal relations among the lights constitutes a problem. Note that to each problem there corresponds a pattern of arrows connecting the lights; but to each pattern of arrows there will in general correspond several problems, because the meaning of each arrow is not unique.

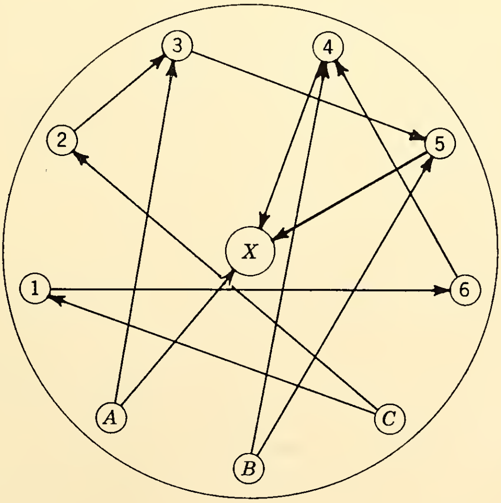
We now include a pattern of arrows on our diagram shown in Figure 1, to show a typical problem as it appears to the subject.

The problem is solved when the subject is able to light *X* by manipulation buttons *A*, *B*, and *C* only. The solution is a series of pressings of these buttons in some combination, including the null combination, in successive time periods. For example, if the solution is indicated by *A*/0/0/*B*,*C*, this means that *A* has to be pressed in the first time period, no button in the second, none in the third, and both *B* and *C* in the fourth, and that this sequence will, through a chain of causal relations, eventually result in the activation of *X*. The nature of the task will be best illustrated by a sample solution.

Starting with the circular diagram shown in Figure 2, let us "unfold" it, i.e., trace the causal connections back from *X* as far as they will go. The result is shown in Figure 3.

The problem is to light *X* by pressing *A*, *B*, and *C* only. From the flow chart we see that *X* can be lit only by some subset of the lights No. 4, No. 5, and *A*, of which only *A* can be manipulated. The "effective" subset, whatever it is, can be activated only by some subset of No. 3, No. 6, and *B*, active during the preceding period. Of these only *B* can be manipulated, etc. Tracing the entire process backwards, we see that lights *C*, *A*, *B*, and *A* are somehow involved *in that order* in the solution. What we do *not* know is whether each of these in turn is to be activated or, on the contrary, is *not* to be activated in the corresponding time period. The answer depends on the causal

Figure 2



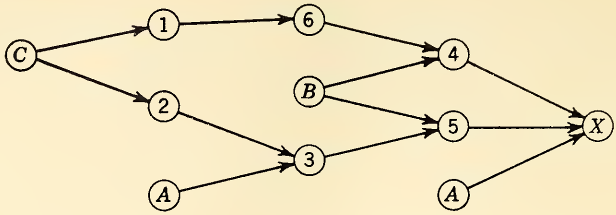


Figure 3

relations which constitute the problem. We will now assign different sets of causal relations to the arrows to show how two different solutions may correspond to the same arrow diagram.

First, let the causal relations be as indicated in Figure 4.

The numbers on the arrows have the following meanings: A "1" means full cause. A fraction indicates partial cause, so that the arrows whose fractions add up to 1 constitute an "effective" set for activating the light on which they converge. Inhibition is labeled by "—1."

From Figure 4 it follows that No. 4, No. 5, and *A* must be simultaneously activated to light *X*. *A* may be activated directly, but No. 4 and No. 5 may not, so we must trace further. We next see that No. 5 can be activated only by No. 3; No. 4 can be activated either by No. 6 or by *B*. But activating *B* will not do, since *B* will simultaneously inhibit No. 5. Therefore *B* must be avoided. Tracing further, we see that *A* likewise should be avoided when No. 2 is active, because *A* inhibits No. 3, which is necessary to light No. 5. The solution of this problem turns out to be *C*/0/0/*A*; that is, *C* should be activated, two time periods skipped, then *A* activated, so as to combine with No. 4 and No. 5, which will have been activated by causal chains started by *C*.

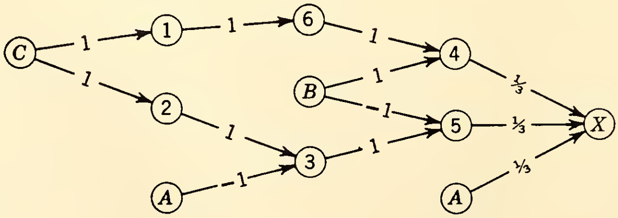


Figure 4

Now let us give the arrows another set of meanings as shown in Figure 5.

Here we see that to light *X*, No. 4 and *A* must be simultaneously activated but without No. 5 (the inhibitor). However, *B*, which is necessary to light No. 4, also lights No. 5. We must therefore *inhibit* No. 5 and this is done via No. 3, which in turn is activated by *A* and No. 2 together. Of these, *A* may be activated directly, and No. 2 via *C*. The solution of this problem is therefore *C*/*A*/*B*/*A*.

It goes without saying that the number of problems which can be constructed with the aid of this apparatus is very large, and that these problems may have a wide range of complexity. Let us turn our attention to the possible measures of this complexity.

Consider the solutions of the two problems examined in our illustration. The flow chart shown in Figure 3 (common to both problems) already reveals that the lights *involved* in the solution are *C*/*A*/*B*/*A* in both cases, except that in the first problem they are involved in the pattern Yes/No/No/Yes, while in the second they are involved in the pattern Yes/Yes/Yes/Yes. In principle, any of the sixteen patterns (except the null pattern No/No/No/No) could be the solution to the problem given by the diagram in Figure 2. Neglecting the inadmissibility of the null pattern, we could therefore put such problems in a class of "four-bit" problems, because four bits of information answer the question as to which of the sixteen (really fifteen) possible patterns is the correct one. We have at our disposal problems ranging from one to six bits of complexity on that level of evaluation. More complex ones can also be constructed. An example of a six-bit problem is given in Figure 6.

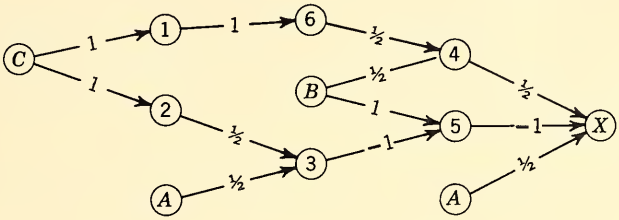


Figure 5

The reader may verify that any of the sixty-four Yes-No patterns (except the null) over the set *C*/0/*A*,*C*/*B*/*A*,*C* may be made the solution of this type of problem.

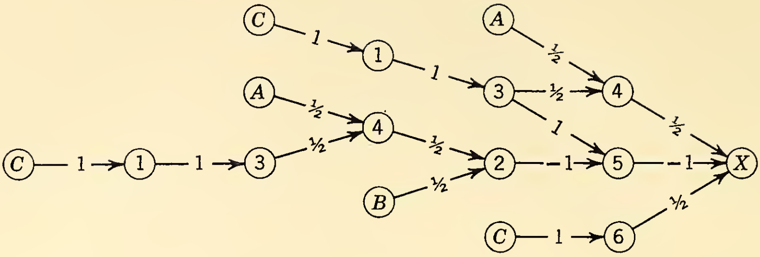


Figure 6

In solving the problem, the subject may activate any lights he wishes directly, i.e., by pressing the buttons beside them. He is then able to gain information concerning the meanings of the arrows. Each such activation, singly or in combination, or in sequence, constitutes a *trial* provided some light is activated in each time period.[3]

As an example, consider the problem shown in Figure 2. The subject may begin by finding out which subset of the set [No. 4, No. 5, *A*] is effective in activating *X*. There are seven non-null subsets, so he may expect to spend at most six trials and on the average three and one-half trials in finding this out. Next, the subject may seek out the subset of [No. 3, No. 6, *B*] which will activate the effective subset found previously. Here, too, there are seven non-null subsets, and so at most six trials and on the average three and one-half trials may be expected to be required at this stage. On the next level, there is ambiguity only about the meaning of the arrows converging upon No. 3 (since a single arrow, such as from No. 1 to No. 6, can mean only full cause). This ambiguity can be completely dissolved in at most two trials, or one and one-half on the average. It follows that, using this system, the subject can expect to get complete information about the problem in at most fourteen and on the average in eight and one-half trials. With this information, the solution can be constructed with certainty. Its construction depends now only on the "reasoning ability" of the subject, and not on further information.

Another, more sophisticated strategy can lead to the complete solution in a fewer expected number of trials. Instead of asking, "What is the effective subset?" at each step, let the subject ask, "Is the lettered light involved or not involved in the appropriate time period?" For example, to find out whether *A* is involved in conjunction with No. 4 and No. 5, the subject might try combinations 4, 5, and 45. If *X* is lit by either of these, he knows that *A* is not involved; if not, he knows that *A* is involved. This will take on the average, two and four-sevenths trials. Similarly, to decide whether *B* is involved in the preceding time period, an average of two and four-sevenths trials is required. To decide about *A* in the next preceding period, only one trial is required. Information about *C* is given automatically by what happens in this last period involving *A*. This method necessitates on the average six and one-seventh trials.

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[3] E. R. John defines a "trial" somewhat differently. In his definition the trial is over as soon as no light is activated by some *causal* relation.

Complex trials, involving more than one period, are also allowed. If a "trial" is interpreted as any succession of activations where some light is always activated, it can be shown that the problem just described can be solved in just two trials. If a trial is defined more strictly, as a sequence in which the chain of *causal* activation is not broken (*cf.* footnote 3), then more trials may be required, but, at any rate not more than five.

The actual number of trials required is one of our measures of performance. There are many such measures, of which we will mention some.

1. Total number of trials.
2. Total time required for solution.
3. Total number of trials *after* all the necessary information has become available (the so-called inferential lag).
4. Time required after all the necessary information has become available.
5. Non-redundancy, i.e., the fraction of trials which actually yield new information.
6. Non-redundancy as a measure of the degree to which the information yielded in the several trials does not overlap.

Besides these efficiency variables, where efficiency of performance is tacitly defined as economy of trials or time, there are any number of "stylistic" measures of performance, for example:

1. Time per trial (rate of decision-making).
2. The number of the trial (or the time-moment) when the shift occurs from predominantly simple moves (involving at most two time-periods) to more complex moves, involving several time-periods.
3. The proportion of complex trials prior to the first activation of *X*.

A higher proportion of such trials indicates a "frontal assault" on the problem rather than a stepwise analysis of intermediate steps.

4. The sequential order of partial solutions. The partial solutions are the various subsets of the solution sequence. The order in which the partial solutions are tried indicates the method of attack.

As we said, the experiments so far performed were directed not toward an experimental approach to organization theory but rather toward investigating the efficiency and character of a cooperative solution of the problem by a three-person group under different experimental conditions. The manipulated variables were (1) problem complexity, (2) the goals, and (3) the state of presumed fatigue of the subjects. We summarize briefly the conditions and the results of these experiments for whatever information these may give about the nature of the problem. Then we will pass to the projected experiments in which this task will be used as a research tool in organization theory. The experimental conditions so far investigated are the following:

1. *Condition N.* After orientation and after solving a practice problem (complexity: three bits), the three-person group was asked to solve two problems in succession (complexity: four and six bits respectively) under the following condition. The group discussed among themselves the next trial to be made. After reaching a unanimous decision, the experimenter was directed to make the trial in question. This continued until the problem was solved.
2. *Conditions D.* Same as *N* except that in the six-bit problem, each trial cost each member of the three-person group twenty-five cents, which they paid out of a stake of fourteen quarters given to them with the understanding that they were to keep what they did not spend on the trials when the problem was solved.
3. *Condition T.* Here each three minutes of discussion time cost each member twenty-five cents.
4. *Condition TD.* Combination of *T* and *D*, that is, each trial *and* each three minutes cost twenty-five cents.
5. *Condition F.* Same as *N*, except that the problem was presented at about 1:30 A.M. after the subjects had spent about five hours working continuously on another (unrelated) task.

The data in all cases were: (1) the record of the trials and the times; (2) a tape recording of the discussion; (3) a sociometric questionnaire filled out after the solution of each problem.

We will briefly discuss the results of our analysis based on (1); then indicate what may be expected from (2), which is now undergoing analysis; then, skipping (3), we will pass on to the design of the next experiment which has more relevance to organization theory.

From the record of the trials and time a very large number of variables can be derived. To begin with, each trial makes available to the subjects information concerning the causal relations of the problem. This information can be quantified and its rate of accumulation recorded. Moreover, the trials themselves may be classified and the solution process may be characterized by the prevalence of the various classes of trials in its successive phases. At first we made an arbitrary list of some sixty variables derived from the trial record. Some of these were so strongly correlated that the total number could be drastically reduced. Still others did not appear to have much relevance for what interested us. Our final reduced list contained eighteen variables, which, in turn, were subjected to factor analysis. This yielded five orthogonal factors, which accounted for about seventy-five percent of the total variance in a population of some 140 solutions (seventy three-person groups solving two problems each). The factor analysis revealed that there were three phases in the solution of a Ψ problem, performance on each phase being roughly independent of the performance on other phases. The first phase involves the trials leading to the first lighting of X, by activating the lights having direct causal connections to it, hence not yet the solution. Since this first activation is largely a result of trial and error, the performance in this phase is largely independent of the rest of the process and of the experimental conditions. The second phase involves the trials from the first lighting of X to the point when all the necessary information has been obtained. If the solution is not arrived at by the end of the second phase, the process enters a third phase, in which the information obtained is all redundant. This third phase has been called the inferential lag, i.e., the lag between the formal availability of the solution and the final insight.

The first three of the five factors turn out to be roughly related to the number of trials in the three phases respectively. The other two factors are "stylistic" ones; the fourth is related to the time per trial, i.e., the rate at which the group decisions are made; and the last, to how early in the process complex moves appear.

The effects of the various experimental conditions can now be described in terms of the changes in the various factor scores averaged over the performances under the experimental conditions in question. Since the factors are orthogonal, we know that the significant changes in the different factors are effected independently. Most of the significant changes are confined to Factors III and IV. Factor I, being a "luck" factor, is not affected by experimental conditions, as one would expect. Factors II and V show less pronounced changes than III and IV. The most striking changes are produced by Condition *D*, in which there is a money incentive for economizing moves. Here the inferential lag, as reflected in Factor III, is drastically reduced, while time per trial increases often five- or sixfold (reflecting careful deliberation of each decision). Condition *F* (fatigue), on the contrary, results in an expansion of the inferential lag especially in the more complex problem (by a factor of about 2). Fatigue also seems to impair the efficiency of the information-gathering Phase 2, but has no discernible effect on the rate of decision-making.

In summary, the following may be concluded from the examination of the overt performance, as indicated by the trial record. Motivation to economize trials is "paid" for by slowing down the rate of decision-making. The opposite incentive, to economize time, has no striking effects. But the effect it does have is in the direction opposite to that of the trial-economizing incentive in practically all the variables. The conflicting motivation to economize both trials and time has an effect intermediate between the other two, as if it were the result of two oppositely directed pressures. This is true of practically all the variables, those showing statistically significant and those showing statistically insignificant changes. The main effect of fatigue seems to be impaired efficiency in Phase 2 and especially in Phase 3, stronger in the more complex problem.

The Recorded Protocol

Whereas the record of trials tells us what the subjects actually did and what information was potentially available to them, the record of their conversation tells us what they thought they were doing and what information they actually used, at least in their discussion. Indeed, the protocol allows us a glimpse into the actual thinking process of the group in a way which is difficult to achieve for one individual solving the same kind of problem. Of course the individual may also be asked to give at each turn his reasons for the trials he chooses to make and to give an account of what he has found out. But this approach is beset with difficulties. Some individuals are reticent about giving reasons for their choices; others are not articulate. At any rate, such interference modifies the problem-solving process considerably. Under the rules of unanimous decision imposed on the group, the discussion becomes *necessary* in the process of solution, and therefore natural. Indeed the running protocol can be content-analyzed with comparative ease.

The running record of the conversation is a string of utterances. The great majority of these utterances (some seventy-five to eighty percent) are statements of facts, inferences, or conclusions, or else questions involving facts, inferences, or conclusions. A typical protocol of a problem contains, on the average, some two thousand utterances. Hence the statistical characteristics of such samples of verbal output can be described with some confidence.

In our study of the effects of experimental conditions we were particularly interested in the extent to which the information available to the subjects at each step of the solution gets mentioned in the protocol. We find that, on the whole, all the relevant facts, inferences, and conclusions are actually mentioned. Moreover, there is a measurable lag between the availability and the utilization of a piece of information. This lag can be measured in different ways. For example, we may take as a measure of the lag the number of acts elapsing between the time an item of information becomes available, to the time it is mentioned assertively and correctly for the first time, or to the time it is so mentioned with no further questions or *wrong* assertions regarding it. We may also note when the inferences deducible from *mentioned* facts (instead of from available facts) are mentioned in the discussion, and then measure the associated lags.

The advantage of protocol-analysis is mainly in the massive character of the data. While the number of trials is generally of the order of ten to forty, the number of utterances is of the order of thousands. Here statistical stability can be expected, and any systematic shifts in the indices so developed associated with the different experimental conditions can be safely assigned to the different effects of the conditions on the group's thinking processes, the effects which have been of principal interest to us.

Projected Applications to Organization Theory

In what follows we will be concerned with the possible effects on the group problem-solving processes produced by different patterns of organization imposed on the group. The experiments to be described will not be attempts to simulate any real situation but rather attempts to establish a strictly controlled and strictly quantifiable process. The essential features will be the following:

1. A division of labor in the problem-solving process among the three participants.
2. An imposed communication network and memory-storage facilities.
3. Quantification of information flow.
4. Quantification of information accumulating during the solution process.
5. Quantification of the efficiency of decisions.
6. Quantification of the efficiency of deduction.

The division of labor will be constant throughout. The imposed communication and memory-storage facilities will vary over four conditions. These four conditions will be the independent (controlled) variables. In each case we will measure the quantities 3, 4, 5, and 6. We hope to deduce at least some empirically verifiable, stable relations among these quantities under each of the experimental conditions, or as a function of the experimental conditions. We will now discuss each of the six items in detail.

1. Division of labor

We distinguish three types of activity in the solution of a Ψ problem, namely (1) observation, (2) analysis, and (3) action-decision. Accordingly, we will divide our three-person group into an Observer, an Analyst, and an Executive.

The Observer is to note everything that happens on the apparatus during the trial.

The Analyst is to make inferences concerning the meanings of the arrows.

The Executive is to decide what should be the next trial.

2. The communication network and the storage facilities

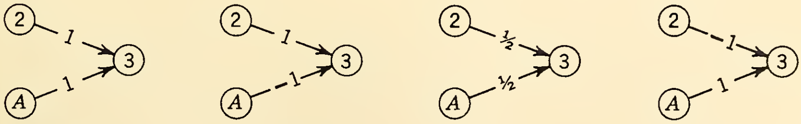
Two extreme conditions can be imposed with respect to each of these, making four conditions in all. Under the condition of restricted communication, information can flow one way only, namely Observer → Analyst → Executive → Experimenter → Apparatus → Observer. Only the Observer sees the apparatus. Specifically, the cycle starts with the Executive. He decides what shall be the first trial and communicates his decision (in writing) to the Experimenter, who makes the trial on the apparatus. The Observer notes the results and transmits to the Analyst information as to what lights went on in the successive time periods until the chain of causation was broken. The Analyst makes his inferences concerning the causal relations on the basis of this information only and transmits it to the Executive, who then makes the next decision on the basis of the information received from the Analyst.

In the opposite condition of unrestricted communication, the information recorded by the Observer, the Analyst, and the Executive is open for the inspection of all. Thus, the Executive under this condition need not rely on the Analyst alone; he can examine the directly observed data of the Observer. Also, the Observer can know what trial has been ordered by the Executive and can direct his attention accordingly. Under this condition, the apparatus is visible to everyone directly. It is thus possible for the Executive to bypass the information supplied by the other two and take all the tasks upon himself, if he is so inclined.

Under the conditions of restricted memory-storage, all the communications are collected by the Experimenter at the end of each trial, so that past communications may not be consulted. Under the condition of unrestricted memory-storage, the communications are allowed to accumulate in the hands of the subjects. However, in the case of restricted communication, each may consult only his own past records; in the case of unrestricted communication, everyone may examine everyone else's past records kept in a common store.

3. Quantification of information flow

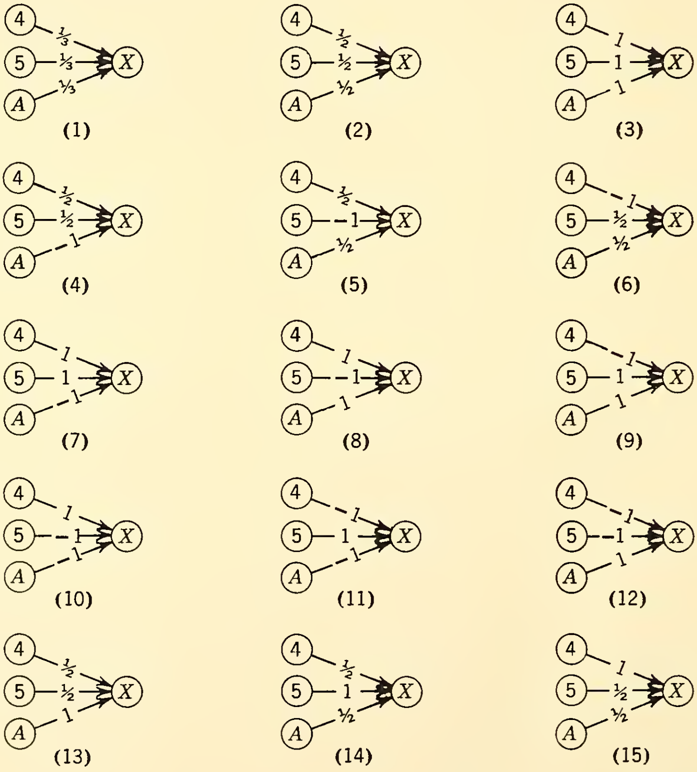
We have indicated above how the complexity of a Ψ problem can be formally measured in bits, because its solution depends on a definite number of Yes-No answers concerning the positive or negative involvement of the lettered buttons in certain time-periods, which can be established by an analysis of the arrow diagram. However, this measure of complexity is not directly related to the kinds of Yes-No answers obtained in the actual trials. The result of each trial restricts the possible range of meanings of the arrows at each converging juncture. To illustrate, consider the juncture of the arrows converging on No. 3 in Figure 3. *A priori*, this set of two arrows can have four possible meanings, shown in Figure 7.



(a) (b) (c) (d)

Figure 7

Suppose now a trial is made. At this juncture, the trial will involve either No. 2 or *A* or both. Suppose it involves only No. 2. Then, if No. 3 lights, possibilities (*c*) and (*d*) are eliminated; if No. 3 does not light, possibilities (*a*) and (*b*) are eliminated. Similarly, the reader may verify that activating *A* will eliminate two out of four possibilities, regardless of what happens, and so will activating *A* and No. 2 together. Therefore each activation will give one bit of information at this juncture. Two activations will resolve the ambiguity completely. In short, there are just two bits of uncertainty at each double juncture. A triple juncture has 3.92 bits of uncertainty. This is because according to our rules, the values of the arrows can be assigned in fifteen different ways ($\log_2 15 = 3.92$). Figure 8 displays all the possibilities of meanings of the triple juncture in Figure 3. The reader may now verify that any trial involving a pair of lights will



(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15)

Figure 8

eliminate eight or seven of these possibilities, depending on whether X lights up or not. Therefore such a trial yields $-\left(\frac{7}{15}\log_2\frac{7}{15}+\frac{8}{15}\log_2\frac{8}{15}\right)=0.996$ bits of information. On the other hand, a trial involving a single light eliminates ten or five possibilities, depending on the outcome and therefore yields $-\left(\frac{2}{3}\log\frac{2}{3}+\frac{1}{3}\log\frac{1}{3}\right)=0.92$ bits of information.

The above illustrates how the information *yielded by the apparatus* can be quantified. The same principle applies to the quantification of information contained in the messages which the participants communicate to each other. Information must always be computed with reference to a certain range of possibilities in terms of the reduction of that range effected by the message. Therefore we must make a convention regarding the possibilities to be considered; otherwise the amount of information in the messages will be ambiguous, as the following examples will show.

Consider the messages sent by the Observer. They will have the following form:

Time-period	I	II	III	IV	
	C	No. 1, No. 2, *A*	No. 6, No. 3	0	. . .

which is to say, C was observed to light in the first time-period, No. 1, No. 2, and A in the second, etc. How much has the Observer communicated? To determine this, we must know what is assumed. If nothing is known about the problem, except that certain lights may or may not go on following the activation of other lights, he has communicated forty bits, because in each of the four periods a "yes" or a "no" has been associated with each of the ten lights on the disc. But, of course, this is too much because much more *is* known. For example, it is known that five of the lights are associated with an odd period and four with an even one. Taking this knowledge into account, only eighteen bits have been transmitted. If the arrows are taken into account, the amount of information is reduced still further. Moreover, the information about which lights were chosen to be activated in the first time-period is not really essential information. This is so because, if the Observer were to confine his reports to what happened in the first time-period, the problem would never be solved, no matter how much of such information he transmitted. What is wanted is the *effects* of lights which have been activated, and the only possible ones which come under consideration are those which are consistent with the arrow chart. Consulting Figure 3, we see that the essential information in the Observer's message is the following: (1) the fact that No. 3 lit following the activation of No. 2 and *A*; (2) the fact that No. 4 was *not* activated following No. 6; (3) the fact that No. 5 was *not* activated following No. 3. Everything else is redundant or inessential. For example, the facts that No. 1 and No. 2 were activated in the second period carries no information, because following the activation of *C* in the first, they *must* be activated, because single arrows lead from *C* to both. Similarly, a single arrow leads from No. 1 to No. 6; therefore the activation of No. 6 tells us nothing new. The fact that *A* was activated in the second period can mean only that it was activated directly, since no arrow leads to *A*. This is information about the trial, not about causal relations. It follows that the Observer's message carried three bits of information essential for solving the problem.

On the basis of this information, the Analyst can eliminate two possibilities from the four associated with the juncture converging on No. 3, two of the four associated with the juncture converging on No. 4, and two of the four associated with the juncture converging on No. 5, i.e., three bits. In other words, if the Analyst utilizes the information transmitted by the Observer completely, he will transmit to the Executive the same amount of information.

We could go further and evaluate each message on the basis of what is known from the previous trials. Thus, some messages which would carry information against a background of ignorance would not carry information against the background of knowledge acquired in the solution process. However, we will make the convention that each message is to be evaluated on the basis of *a priori* knowledge only. We will evaluate the *accumulated* information separately, as will be described in the next paragraph.

4. Quantification of accumulated information

It is the Analyst's job to make inferences concerning the causal relations. He can record these inferences by crossing out the causal relations which are excluded by what has been observed. Thus the Analyst has in front of him a chart such as is shown in Figure 8, to which the possible meanings of the remaining convergences have been added. There are fifteen possibilities associated with the triple juncture and four possibilities with each of the three remaining double junctures, i.e., twenty-seven in all. The original amount of uncertainty, then, is $\log_2 15 + 3 \log_2 4 = 9.92$ bits. When, after having made some inferences, the Analyst crosses out some possibilities, we compute by the same method the amount of uncertainty remaining. The second quantity subtracted from the first gives the amount of information (i.e., negative uncertainty, or negentrophy, as it is sometimes called) accumulated. In addition to transmitting the information gained from a trial, the Analyst must also submit to the Executive the accumulated information each time. In the unrestricted memory-storage condition, he simply adds new information onto a sheet which is kept; but in the restricted memory-storage, he must reproduce the accumulated information from his own memory.

5. *Quantification of the efficiency of decision*

If the accumulated information is taken into account, each proposed trial has a certain *a priori* information-content associated with it regardless of its outcome. To take an example, suppose the first move in our example problem has been *A*, No. 5 and that *X* did not light. The possibilities 2, 3, 6, 9, 13, 14, and 15 of Figure 8 have been eliminated. The possibilities 1, 4, 5, 7, 8, 10, 11, and 12 remain. Three bits of uncertainty remain at this juncture. Suppose *A* is contemplated for the next trial. If *X* does not light, two further possibilities are eliminated (8, 10); if it does light, six further possibilities are eliminated. Therefore the amount of information associated with this trial at this point is $-\left(\frac{1}{4}\log\frac{1}{4} + \frac{3}{4}\log\frac{3}{4}\right) = 0.81$ bits. Suppose No. 4 is contemplated. Here the uncertainty to be resolved is 0.95 bits. But if [No. 4, No. 5] is contemplated, four possibilities are eliminated either way, and so this trial is worth a full bit. In this way the *a priori* uncertainty-resolving potential of each trial can be computed.

Note that the amount of uncertainty *actually* resolved by each trial will not in general be the *a priori* amount, because the latter is computed as the expected average and the former depends on the particular problem. However, in evaluating the "potency" of each trial, we must use the former measure, since the answer is, of course, not known in advance.

6. *Quantification of the efficiency of the deduction*

After all the information is available, deduction alone ought to suffice to state the solution of the problem. Except in the case of the simplest problems, this will not in general happen. Several additional questions will be asked, all of them redundant. This inferential lag may be taken to be a measure of departure from perfect deductive efficiency of the Executive. The deduction efficiency of the Analyst can be taken in the restricted-communication case as the ratio of the amount of information in each of his messages to the amount of information that he might have inferred on the basis of the information furnished by the Observer.

Given now one of the four experimental conditions, i.e., an imposed structure of communication- and information-storage, we can use the measures so derived as a quantitative description of the performance. Each group will be characterized by a certain average flow of information through the Observer. In general there will be some loss of this flow in the Analyst in the case of restricted communication. But in the unrestricted-communication case there may be a gain, because there the Analyst can get his information directly from the apparatus. Indeed if there is a gain of information in the Analyst's messages, we can conclude that he is "bypassing" the Observer and is getting it directly from the apparatus. We can also suspect that the Executive bypasses the Analyst in the unrestricted case, if he guesses the solution before the Analyst has completed all the relevant inferences. In the restricted case, of course, the Executive can know no more than what the Analyst tells him and may actually know less.

This scheme allows each of the participants to be "graded" separately on his performance. In the restricted case, of course, the Analyst's inferences must be related only to what the Observer has told him, even if the latter conveyed false information, as will frequently happen. Similarly, the Executive's decisions must be related only to the Analyst's summary of inferences, even though these may be incomplete or in error. In the unrestricted-communication condition, the individual performances must be evaluated in reference to the total information available, since it has been available to all.

The possibility of evaluating the individual performances of the three participants, each in a different role with respect to the problem-solving process, allows us also to assess the relative importance of the roles as here described. As an example, consider the statistical correlations between the performance scores of the Observer, the Analyst, and the Executive respectively with some measure of efficiency of the group's performance. The higher this correlation, the more important the corresponding role for the process. Similarly, the role of communication and of memory-storage facility can be assessed. All these factors may have different weights in problems of different complexity.

Finally, the complexity of the problem may be reflected in different degrees in the three roles.

In principle, the experimental conditions studied previously can also be introduced in the context just described. Motivational emphasis and fatigue stress may be introduced and their effects on the different roles evaluated. Which function begins to deteriorate first in protracted sleeplessness, the Observer's attention, the Analyst's logic, or the Executive's strategy?

An interesting conjecture suggests itself here, which points up the genuine "group" nature of the problem-solving process under the condition of the division of labor. We have indicated that the Executive's performance will be rated the higher, the more uncertainty-resolving potential is contained in the trials he orders. Obviously the more complex trials, i.e., those involving combinations of buttons and several successive time-periods, will in general have more uncertainty-resolving potential. They are questions that will yield complex answers, packed with information. The more of these the Executive orders, the higher will be his score. But this high score may not at all pay off on the level of group efficiency, for complex trials place a big load on both the Observer and on the Analyst. If they are not able to handle the load, they may make errors. The Executive is not debited with these errors, since his decisions are evaluated independently of the performance of the others. But, of course, decisions made on the basis of erroneous data will not be helpful in the efficient solving of the problem. Thus it may turn out that the overtly ambitious Executive, even if he is an able one, may actually detract from the efficiency of the over-all performance. There may very well be an optimum, a pace set by the Executive, which just utilizes but does not overload the capacities of the others. It is tempting to think that the good Executive will be guided by some sort of feedback from the others.

During unrestricted communication, the Executive may, if he wishes, ignore the other two completely, since the information from the apparatus is directly available to him. The frequency and the extent to which this is observed will tell us something about the value of this role division, for example, whether it is felt to be an unnecessary burden or an advantage. It may happen that many an Executive, impatient with the complex group-process, will decide to bypass the others but will show only a pedestrian performance compared with team performances, especially after several problems have been solved and the teams have gotten the knack of the organized process. On the other hand, this may not happen; enterprising, unilaterally acting

Executives may be the very ones who are good at this sort of thing and may make a better showing than the groups.

Comparison of past performances on the Ψ apparatus between individuals and groups shows that groups, solving the problem cooperatively under the condition of free discussion and unanimous decisions on each trial, invariably use fewer moves than individuals solving the same problems (about one-fourth to one-half the number). The *time* used to solve each problem is approximately the same for groups and individuals. The reason for the economy of moves is not far to seek. Since trials and reasons for making them must be discussed, there are far fewer repetitions of trials by groups than by individuals. Verbalization of the causal relations makes for systematic steps in the solution. Individuals are much more prone to push buttons more or less randomly "to see what will happen." But individuals also work much more rapidly, making trial after trial without having to discuss them. Thus, on this level, comparison between individual and group performances is not too meaningful.

The entire question of individual *versus* group efficiency in the solution of problems is a difficult one to answer meaningfully. Many a quantitative comparison is obscured by artifact. For instance, if in the group approach there is an opportunity for one individual to take leadership, it may happen that the most competent individual will most frequently take leadership with the result that the average of an n-person group performance will really be the average of the best of n randomly selected individuals, which will always be higher than the average taken over single arbitrarily selected individuals. Contrariwise, if the conditions of solution are such that *every one* must understand the solution, it may be that the least competent in the group becomes the pace setter. These statistical effects obscure the question originally asked: How do cooperative groups and individuals compare in the solving of certain problems?

The division-of-labor scheme described here tries to get around some of these difficulties. Under the condition of restricted communication, it is impossible for any one individual to "take over." Under other conditions this does become possible but only for one individual, namely the Executive. Thus, it will not be necessarily the "best out of three" that will determine the level of the performance. Then the level can be meaningfully compared with that of individuals working alone and with genuine group performances.

Another feature of the proposed experiments is the particular use of information theory in the description of the results. Fundamental in this theory is the definition of the amount of information contained in a message in terms of probabilities of selecting a certain class of messages from a source with given statistical characteristics. As originally proposed, the theory was designed for use in telecommunication engineering. Characteristically, the "meaning" of messages played no part in this formulation. Problems of concern were the design and utilization of channels for transmitting in coded form series of conventional symbols originating at a source.

Here, however, we are dealing not so much with communicative as with *cognitive* aspects of information theory. We are not concerned either with efficient coding methods or with channel characteristics. We are concerned with semantic content of the messages, namely with their potential for reducing uncertainty about a real state of affairs. Information is measured in these terms, not in terms of how many symbols or messages flow over a channel. There has been considerable confusion in the attempts of social scientists to apply information theory to communication problems, and we think that the confusion results from shifting vaguely between the communicative and cognitive aspects of information theory. The former treats exclusively of the transmission of symbols (without reference to their referents) and the associated problems of symbol transmission. The latter treats of the referents behind the symbols and bypasses the technique of transmission.

In conclusion, a word may be in order concerning the possible value of this approach to organization theory. As has been pointed out, the approach is strictly and frankly a laboratory approach. The situation is specifically contrived in accordance with the demands of controlled experiment. No attention has been paid to verisimilitude; no simulation however remote of any real situation has been attempted. At this stage there are even no hypotheses offered. The aim is to get a quantitative description of what happens under quantitatively describable conditions.[4] Needless to say, this isolation of the laboratory situation (from the real problems faced by organization theorists concerned with real, existing organization) precludes any extrapolation of conclusions and, therefore, also any immediate application to our knowledge of organization as it actually exists in human affairs. It has even been pointed out that it is misleading to call the task here described a "problem"; that "exercise" is a more appropriate word, problems being characterized by the necessity to define and circumscribe the "problem," whereas in exercises this is typically done for the subject by the experimenter.

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[4] The aim of such experiments is not to test a theory, but to make possible observations which can be cast into theoretically meaningful terms. We think that experiments of this type are the next logical step, following such theoretical formulations as those of J. Marschak. *Cf.* this author's "Towards an Economic Theory of Information and Organization," in *Decision Processes* (R. M. Thrall, C. H. Coombs, and R. L. Davis, eds.), Wiley, New York, 1954; "Elements for a Theory of Teams," *Management Science,* 1, 127–137 (1955). See also "Round Table Discussion on Behavior Theory," *Behavioral Science,* 1, 69–78 (1956). Another source of inspiration for the present approach can be found in A. Bavelas, "A Mathematical Model for Group Structures," *Applied Anthropology,* 7, 16–30 (1948).

I think that the advocate of the laboratory approach has no choice but to admit the force of all these objections. In defense of this approach, it can be argued only that it does not imply any *intent* to extrapolate from laboratory results to conclusions pertinent to the theory of organizations. The intent is to develop the laboratory approach in its own context; and the hope is that after much accumulated experience (*only* after *very much* accumulated experience) questions may be suggested, which might not have occurred otherwise, questions which will lead to pertinent observations on real organizations. Not experimental results but experimental techniques are the expected fruits of this approach. Psychology became a full-fledged science only after the experimental psychologist became a virtuoso, i.e., developed methods of control, refined measurement, and sophisticated inference with regard to his material, largely the behavior of individual organisms. As far as laboratory behavior has been—and remains—from behavior in "real" situations, it was the study of laboratory behavior which promoted psychology into a science. It is hoped that the process can be repeated on the level of the small group, the material of social psychology, and of experimental sociology.[5] If contributions to a well-founded theory of organization are to come from these disciplines, it seems worthwhile to develop them along the lines which have been successful in other fields.

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[5] In our view, experimental sociology is concerned with processes where the structure of a group as described by division of labor, lines of authority, or channels of communication is of central interest as a determining or determined factor.

CHRIS ARGYRIS

5.

Understanding Human Behavior in Organizations: One Viewpoint

The Focus of the Research

I SHOULD LIKE TO BEGIN WITH AN ASSUMPTION THAT HUMAN BEINGS are need-fulfilling, goal-achieving unities.[1] They create various types of strategies to fulfill their needs and to achieve their goals. One of the most important strategies is to organize themselves. There are

[1] In my opinion it is important that needs conceptualized to exist within the personality be also represented in the environment through the concept of goals. This implies, as Lewin, Sullivan, Fromm, May, Rogers, and others have said, that behavior is a function of the individual and the situation (environment) in which he is imbedded. See Andras Angyal, *Foundation For a Science of Personality,* The Commonwealth Fund, New York, 1941, especially pp. 88–123.

The writer wishes to express his appreciation for the support he has received from the National Institute of Mental Health (3M-9128C).

several strategies by which human effort may be organized. Historically, the most frequently used strategy is that which, when seen in its static form, results in a pyramidal structure usually called the formal organization.

The research of the writer is directed at, and limited to, understanding (and consequently predicting and controlling) the behavior in organizations that initially begin with or include as a minimum, two sets of variables—the formal organization and the individual. Schools, churches, industrial plants, banks, governmental agencies, trade unions, hospitals, and the military services are but a few empirical examples. The research designs should lead to a theory and generalizations applicable to all organizations of the class defined above. Every study, although conducted in a specific organization, should result in findings generalizable to other organizations.

Keeping these problems in mind, how is one to proceed? The first task is to develop concepts that mirror reality accurately (Cassirer, 1923). Accurate coverage of reality does not necessarily mean a total coverage (Cohen, 1931). It is the comprehension of all the *relevant* variables. Relevant variables are those that have causal effects (Lewin, 1951). To understand the cause of some phenomenon one must be able to answer the question, "What brings it about?" (Selye, 1956). The scientist must be able to describe the mechanisms which lead to the phenomenon being studied.[2]

The conceptual strategy used

What are the relevant variables in studying organizations and do they relate to cause the phenomena under study? This is indeed an extraordinarily difficult question to answer for the behavioral scientist attempting to study behavior in organizations. The variables are so numerous and the interrelationships so complex that he must be very careful in conducting his research lest he miss the very complexity that is so characteristic of organizations.

The biologists, because of their long experience in studying organizational phenomena, have much to teach the student of social organization. For example, some students of social organization believe that it is possible to understand organizations by breaking down the complexity into smaller and more manageable units (through the traditional independent-dependent-variable design). The organization, they reason, will be understood when the results of the separate experiments are finally synthesized. This strategy has much in its favor, and the author uses it in some of his research (Argyris, 1959). It tends to be more rigorous and the variables more easily quantified. However, it has limitations, some of which have been highlighted at a recent symposium on biological theory. Paul A. Weiss, for example, in criticizing such procedures states quite clearly that organization is not something one can understand by synthesizing the results of several carefully controlled experiments (that focus on parts of an organization). Organization may be something which has *"stability only if the components are present all at the same time."*[3]

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[2] In the more advanced sciences the description is on a conceptual level.

In reading the account of the above symposium one notes the emphasis placed upon the *pattern* or *order* of organization. Understanding the pattern, therefore, is a crucial objective of organization research.

How is one to understand a pattern of variables whose interdependence is so complex? One possibility is to assume that organizations, although complex in their present state, begin from simple beginnings (let us say, one or two variables) which once "fused" together, generated new variables, which, in turn, generated new ones, etc. This method of analysis is not unlike the one used by those trying to understand the beginnings of the universe. They begin by assuming the existence of a few variables. Knowing the properties of these variables they can predict the resultants of their interrelationships. Once the resultants are understood, new predictions can be made. The "evolutionary" process is continued until the present state of complexity is reached.

The same type of thinking may be valid for the study of social organization. For example, let us begin with the pattern of a social organization which, in essence, is a highly complex set of interrelationships of multilevel parts.

If we accept this mode of analysis, then the first step is to select a small number of parts with which to begin weaving the pattern. Formal organizations and human beings seem to be two basic parts. Next, we ask, what is known about the properties of these two unities? From this knowledge we should be able to predict the resultants when these two variables are brought into relationship with one another. In this manner, we may be able to enumerate the relevant variables and their interrelationships which constitute the pattern or organization under study.

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[3] Underlining is mine. R. W. Gerard, (ed.), "Concepts of Biology," *Behavioral Science,* 3, No. 2 (April, 1958), p. 128.

A theoretical model of organizational behavior: a first approximation

The writer has attempted such a step. The results are reported in detail elsewhere.[4] By beginning with the research literature on the nature of personality and formal organization, he was able to evolve the beginnings of a theoretical framework which defines some of the relevant variables and their interrelationships (i.e., the processes by which they influence one another).

In order to acquaint the reader with the framework, some of the basic propositions are *outlined* below.

1. The development of the human personality can be hypothesized to follow the directions and dimensions outlined in the following model. It is assumed that human beings in our culture:
   (*a*) Tend to develop from a state of passivity as infants to a state of increasing activity as adults. [This is what Erikson (1950) has called self-initiative and Bronfenbrenner (1951) has called self-determination.]
   (*b*) Tend to develop from a state of dependence upon others as infants to a state of relative independence as adults. Relative independence is the ability to "stand on one's own two feet" and simultaneously to acknowledge healthy dependencies.[5] It is characterized by the liberation of the individual from his childhood determiners of behavior (e.g., family) to develop his own set of behavioral determiners. This individual does not tend to react to others (e.g., the boss) in terms of patterns learned during childhood (White, 1952).
   (*c*) Tend to develop from being capable of behaving only in a few ways as an infant to being capable of behaving in many different ways as an adult.[6]
   (*d*) Tend to develop from having erratic casual, shallow, quickly dropped interests as an infant to having deeper interests as

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[4] For a detailed discussion see Chris Argyris, *Personality and Organization*, Harper's, New York, 1957.

[5] This is similar to Erikson's "Sense of Autonomy" and Bronfenbrenner's "State of Creative Interdependence."

[6] Lewin and Kounin believe that, as the individual develops needs and abilities, the boundaries between them become more rigid. This explains why an adult is better able than a child to be frustrated in one activity and behave constructively in another. See Kurt Lewin, *A Dynamic Theory of Personality*, McGraw-Hill, New York, 1935; and J. S. Kounin, "Intellectual Development and Rigidity," in *Child Behavior and Development*, R. Barker (ed.), J. Kounin, and H. R. Wright, McGraw-Hill, New York, 1943, pp. 179–198.

an adult. The mature state is characterized by an endless series of challenges, in which the reward comes from doing something for its own sake. The tendency is to analyze and study phenomena in their full-blown wholeness, complexity, and depth (White, 1952).

(*e*) Tend to develop from having a short time-perspective (i.e., the present largely determines behavior) as an infant to a much longer time-perspective as an adult (i.e., where the behavior is more affected by the past and the future).[7] Bakke cogently describes the importance of time-perspective in the lives of workers and their families and the variety of foresight-practices by means of which they seek to secure the future (Bakke, 1940).

(*f*) Tend to develop from being in a subordinate position in the family and society as an infant to aspiring to occupy an equal and/or superordinate position relative to their peers.

(*g*) Tend to develop from a lack of awareness of self as an infant to an awareness of and control over self as an adult. The adult who tends to experience adequate and successful control over his own behavior tends to develop a sense of integrity (Erikson, 1950) and feelings of self-worth (Rogers, 1951). Bakke (1940) shows that one of the most important needs of workers is to enlarge those areas of their lives in which their own decisions determine the outcome of their efforts.

2. Many human problems in organizations arise because relatively healthy people in our culture are asked to participate in work situations which coerce them to be dependent, subordinate, submissive, to use *few* of their more *skin-surface* abilities.
3. There are three major sets of variables which cause the dependence, subordination, etc. The formal organization-structure is the first variable (includes the technology). Directive leadership is the second, and managerial controls (budgets, incentive systems, quality control, motion and time studies) is the third.
4. The degree of dependence, subordination, etc., that these three variables cause tends to increase as one goes down the chain of command and as the organization takes on the characteristics of mass production.

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[7] Lewin also cites the billions of dollars that are invested in insurance policies. Kurt Lewin, "Time Perspective and Morale," in *Resolving Social Conflicts,* Harper's, New York, 1948, p. 105.

5. Healthy human beings (in our culture) tend to find the dependence, subordination, etc., frustrating. They would prefer to be relatively independent, aspire to positions equal to or higher than their peers, to be active, and to use many of their deeper abilities. Frustration leads to regression, aggression, and tension. These in turn lead to conflict (the individual prefers to leave, but fears leaving). Moreover, it can be shown that under these conditions the individual will tend to experience psychological failure and short time-perspective.
6. Individuals will adapt to the frustration, conflict, failure, and short time-perspective by creating any one or a combination of the following *informal activities.*
   (*a*) Leave the situation (absenteeism and turnover).
   (*b*) Climb the organizational ladder.
   (*c*) Become defensive (daydreaming, aggression, grievances, regression, projection, feelings of low sense of self-worth).
   (*d*) Become apathetic, disinterested, non-ego-involved in the organization and its formal goals.
   (*e*) Create informal groups to sanction the defense reaction in (*c*) and (*d*).
   (*f*) Formalize the informal groups in forms such as trade unions.
   (*g*) De-emphasize in their own minds the importance of self-growth, creativity, etc., and emphasize the importance of money and other material rewards.
   (*h*) Accept these above ways of behaving as being proper for their life outside the organization.
7. Management[8] will tend to view most of the informal activities as detrimental to the formal organization. They will tend to resist the informal activities by tightening the formal organization structure, directive leadership, and managerial controls. This closes the circuit, and one has a circular process in seemingly perpetual motion.

A word about the propositions outlined above. It is possible for a physical scientist to make such predictions as, if one passes electricity through wire, heat will result. However, he cannot predict *a priori how much* heat will result. The amount of heat can be predicted only by ascertaining the values of such variables as the length and type of wire, the capacity of the battery, the milieu in which the experiment is conducted, etc.

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[8] I use the word "management" to represent any administrator in a formal organization.

The propositions presented above are on a similar level of generalization. They make such predictions as the dependence, submissiveness, etc. that people will experience will tend to be caused by the formal organization, directive leadership, and managerial controls (to list only three major variables). They predict that the dependence and submissiveness will frustrate the people and place them in conflict *if* the people aspire toward the mature ends of the continua listed above. They predict further that people will tend to react by creating informal activities (e.g., apathy, indifference, goldbricking, rate-setting, etc.). Nothing is said, however, about *how much* dependence, submissiveness; *how much* conflict, frustration; *how much* apathy, indifference, etc. This is a matter of empirical research. The value of the theoretical propositions is that they guide the researcher in his choice of relevant variables and the probable relationships among these variables.

For example, one can predict that the conflict, frustration, etc., will tend to be high when the formal organizational structure, the directive leadership, and the controls require (*a*) "maturity-directed" people to be directed toward infancy[9] and (*b*) "infancy-directed" people to be directed toward maturity. One can predict, therefore, that absenteeism, turnover, apathy, etc., will be as high when "mature" people are frustrated by being required to be immature as when "immature" people are frustrated by being required to be mature. Furthermore, one can predict that the conflict, frustration, etc., will tend to be minimal when (*c*) "infancy-directed" employees are required to behave immaturely.[10]

The predictions above assume that the *amount* of impact of the formal organization structure, the leadership, and the managerial controls is the same. This may not be the case in actual practice. One might find that the directive leadership, in a given organization, causes more dependence, etc., than do the formal organizational structure or the controls. In another organization, the controls may be the major cause of dependence. In short, in the actual world many different combinations are possible.

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[9] The "amount" of conflict, frustration, etc., must be empirically ascertained by measuring the "maturity-directiveness" of the employees and the degree to which the organization requires that they be "infancy-directed."

[10] Case (*a*) was chosen to be illustrated in my *Personality and Organization* because most of the research literature that the writer is aware of supports the view. This does *not* imply that *all* organizations can be so categorized. Organizations will differ, and the same organization may differ at different periods of time. In *Personality and Organization* I cite job enlargement, role enlargement as two activities that inveigh against the trend predicted above.

The predictions above also assume that the *direction* of impact for all three variables is the same. Thus, the theory hypothesizes that if the formal structure is defined according to such principles as unity of command, task specialization, etc., and if the leadership is directive, and if the controls are defined as they are in scientific management, then employees will tend to experience dependence, submissiveness, etc.[11] Thus the theory hypothesizes *a priori* that these three variables (as defined in the theory) will always lead toward dependence, submissiveness, etc.[12]

From the model to the specific case

As the theoretical model above develops, two activities should become possible. First, hypotheses should be derived, which may then be tested by empirical research. The results of these studies, in turn, will help to modify the theoretical model to make it a more valid mirror of reality. This activity represents the objective of developing generalizations relevant to all organizations of the universe delineated above.

In the writer's experience, however, such research tends to miss the uniqueness and the complexity of the specific case. Apparently, the theoretical points of view that he utilizes are not powerful enough to generate valid generalizations for the universe of discourse being considered, and simultaneously generate complete understanding of the specific case. Medical colleagues say that they experience similar difficulties. For example, although a particular process can be derived from research for the cure of an illness, the impact of this process on a *particular case* is difficult to predict accurately beforehand. As a result the clinical diagnostic experience is quite important in medicine.

It may be, therefore, until organizational theory becomes more powerful, that research is *also* needed that focuses on understanding fully the totality, complexity, and uniqueness of the specific case.[13]

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[11] May I again remind the readers (especially the practitioner) that the model purports to understand all organizations who use (at the outset) a pyramid structure, and people. Thus churches, families, schools, and scout troops (to use a few examples) coerce dependency, etc. long before people become employees of industrial organizations.

[12] Again the problem of ascertaining *how much* dependence, submissiveness, etc., is an empirical one that requires research. Also, the impact or effect of dependence, submissiveness, etc., upon the individuals and in turn upon the organization cannot be predicted without knowing the needs of the individuals. If they desire to be dependent, the effect will be different than if they desire to be independent.

Although both research activities are of interest to the writer, the focus of the ensuing discussion is the research that attempts to focus on a specific organization.[14]

Understanding completely the single case by the use of a theory is a sign of an extremely advanced science. It may or may not be completely achievable in the study of organizational behavior. The theoretical model being evolved by the writer (and presented above) is so underdeveloped and primitive that the gap between the theory and understanding a particular case is very large indeed. The most that the model does is to provide the researcher with a list of probable relevant variables and some of their interrelationships.

To fill in the gap between theory and reality, the writer has evolved, from his research experiences and from reading the literature, a set of guideposts. They form a "working point of view" which provides him with a crude methodological map to advise him on certain crucial decisions regarding the research strategy. This does not imply that the writer fulfills the requirements implied in each of the guideposts. Rather, they are best viewed as ideal objectives toward which he aspires but is far from achieving. With the conclusion of each research project, and the reading of new literature, the "working point of view" is modified. Hopefully as the results of the research add to the theory, the necessity for the guideposts may diminish.

At this stage of development, however, the guideposts are very crucial—especially in defining the basic nature of the research objectives and methods, influencing the attitudes of the researcher in his everyday data-gathering activities, and finally in the analysis and reporting of the results.

Some guideposts in diagnosing organizational behavior

The first assumption made is that the way organization has been, and continues to be described, in the traditional literature of scientific management, public administration, industrial engineering, and industrial economics is not complete. The assumption is inferred from the now numerous studies and the countless everyday observations that an organization is something more than what is published in the policies and practices, and represented on the formal organizational charts.[15]

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[13] The writer desires to emphasize that the differentiation of these two types of research activities is necessary because of the primitiveness of his approach. The separation being made between the "general" and "specific" is a temporary one. As the research matures, the gap between the two, it is hoped, will also decrease.

[14] Those interested in an example of how the model can lead to hypotheses which result in generalizations applicable to the total universe being considered may see the author's "The Individual and the Organization: An Empirical Test," *Administrative Science Quarterly*, September, 1959.

Further evidence for the validity of the assumption is, in the writer's opinion, the literature that exists on the basic nature of organization as seen by biologists, physicists, chemists, medical researchers, anthropologists, some economists, and general-system theorists. There is an increasing awareness that organization (or system) is a basic property of life—if not life itself. If one takes this literature seriously (and the writer does), then one arrives naturally at the assumption that the basic properties of human or social organizations are fundamentally similar to those of organizations existing on different levels of analysis. Not only is this an assumption and an act of faith; it is a deep hope. If someday it can be shown that the different levels of scientific analyses can be integrated through the concept of organization then an important step will have been taken in unifying knowledge.[16]

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[15] For example, see the work of Bakke, McGregor, Whyte, Shartle, Arensberg, Dubin, etc.

[16] Examples of writings that have been most helpful to me are: R. Morley, *Biopolitics,* Dent, London, 1950; R. Redfield (ed.), *Levels of Integration in Biological and Social Systems,* Jacques Cattel Press, Lancaster, Pa., 1942; J. K. Feibleman, "Theory of Integrative Levels," *Brit. J. Philo. of Sci.,* V, No. 17 (May, 1954), pp. 59–66; S. F. Nadel, *The Foundations of Social Anthropology,* Cohen and West, Ltd., London, 1951, pp. 29–30; K. Boulding, *The Image,* Univ. of Michigan Press, Ann Arbor, 1956; M. J. Klein, "Order, Organization, and Entropy," *Brit. J. Philo. of Sci.,* IV, 1953; T. A. Szasz, "Entropy, Organization and the Problems of the Economy of Human Relationships," *Int. J. of Psycho-analysis,* 36, July–October, 1955, pp. 289–297; *Profits and Problems of Homeostatic Models in the Behavioral Sciences,* Chicago Behavioral Sciences, No. 1; L. V. Bertalanffy and A. Rapoport (eds.), *General Systems,* Yearbook of the Society for the Advancement of General Systems Theory, 1, 1956; L. V. Bertalanffy, *Problems of Life,* Wiley, New York, 1952; "Problems of General System Theory," *Human Biology,* 23, No. 4 (December, 1951), pp. 302–312; E. W. Sinnott, *Cell and Psychology,* Univ. of North Carolina Press, Chapel Hill, 1950; T. C. Schneirla, "The 'Levels' Concept," in J. H. Rohrer and M. Sherif, *Social Psychology at the Crossroads,* Harper's, 1951, pp. 18–120; K. Goldstein, *The Organism,* American Book Co., New York, 1939; H. Margenau, *The Nature of Physical Reality,* McGraw-Hill, New York, 1950; T. Shirai, "Systematic Models of Social Groups," *Canad. J. Psychol.,* Univ. of Toronto Press, 7, No. 8, pp. 126–132; F. H. Allport, *Theories of Perception and the Concept of Structure,* Wiley, New York, 1955; A. Mace, "Homeostasis, Needs and Values," *Brit. J. Psychol.,* (General Section),

The present objective of the writer in reading the literature is to help him formulate propositions about the basic nature of organization that cannot be found in the literature of traditional, formal organizational theory. These propositions, it should be emphasized, do *not* form a theory. They are merely the beginnings of a framework that someday may be integrated with the theoretical framework presented above.

Some examples of propositions that the writer has evolved from his reading and uses as basic guideposts are: An organization is characterized by an *arrangement* of parts that form a unity or whole which feeds back to help maintain the parts (Weiner, 1950). A "part" of an organization is actually an "organic" part in that it exists by virtue of its position in the pattern that is the whole (Kluckhohn, 1955). The whole, in turn, may be differentiated from the parts along two dimensions. First, the whole has a different boundary than any given part (or subset of parts) (Herbst, 1957; Simon, 1952). Second, the functional unity of the whole displays properties only revealed in the actual process of full operation of the whole (Kurtz, 1956).

These propositions have led the writer to form his own (very) tentative conceptual definition of organization. An organization is

1. a plurality of parts
2. each achieving specific objective(s), and
3. maintaining themselves through their interrelatedness, and
4. simultaneously adapting to the external environment, thereby
5. maintaining the interrelated state of the parts.

The reader may wonder how such theoretical notions can be of help to a researcher in planning his research strategy. Actually, a number of specific research actions are implied in these theoretical ideas.

1. The first implication is that the research strategy should strive to understand the *patterning* of all the relevant parts as well as the nature of each part. If the properties and the output of the whole are revealed in the full operation of the whole, then one must focus the research to "capture" the wholeness of the unity under study (Kennedy, 1955). It is possible that a research strategy which assumes that a series of "part" studies eventually

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XXXX, Part 3, August, 1953, pp. 200–210; E. W. Sinnott, "The Biology of Purpose," *Amer. J. Ortho-Psychiatry,* XXII, No. 3, July, 1952, pp. 457–468; E. Cameron, *General Psychotherapy,* Grune and Stratton, New York, 1950.

added together will provide insight into the whole, may lead to failure.[17] For example, the writer learned—after a series of failures—that leadership behavior, one part of an organization, could not be separated *by the subjects* from such parts as managerial controls and organizational structure (Argyris, 1959). The part (leadership) could not be studied separately from the whole.

2. The definition of organization also emphasizes the organization's tendency toward stability or constancy. This implies that research should focus on the specific mechanisms by which the parts create the whole and by which the whole feeds back to maintain the parts. Change in an organization may not therefore be understood unless the "equilibrium" or "steady state" of the organization is first understood (Selye, 1956). If this guidepost is valid, then researchers need not enter arguments as to the importance of the study of change *versus* the tendency toward constancy. Both are important, but in a specific case the latter precedes the former.
3. The "parts" of an organization exist on many levels. For example there are individuals, informal groups (large and small), departments, divisions, cultural norms, etc. Since all the parts that are relevant need to be studied, the diagnostic methodology should cope with variables on different levels of analysis. It should be able functionally to relate: variables of personality, the informal group, and formal organization without much difficulty. To relate the variables to one another functionally is to arrange them in a meaningful pattern and to be able to show the processes (mechanisms) that maintain this pattern. For example, one might have to construct a pattern in which personality variables are connected to informal-group variables and those in turn to formal-organization variables and the latter to cultural variables, etc. In short, the diagnostic methodology should take its cue from the nature of the phenomena under study, and not from the traditional academic boundaries.[18]

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[17] Psychologists who know the history of "Structuralism" are intimately acquainted with the limitations of such logic. For an interesting discussion of similar problems in biological research, see J. Z. Young, "The Evolution of Organization Within the Nervous System," *Advancement of Science*, XIV, No. 54, (September, 1957), pp. 48–57. Also the symposium in "Concepts of Biology" cited in footnote 3 is relevant.

[18] For a relatively crude example, see the appendix to the writer's *Personality and Organization*, cited on p. 5.

Perhaps these examples are adequate to illustrate the value of the definition of organization proposed above. This list is by no means a complete presentation of the guideposts inferred from the definition of organization. However, because of space limitations, we must turn to a few of the guideposts used also by the writer which are inferred from the literature on the nature of the scientific method and philosophy of science. For example:

4. The diagnostic methodology should aspire toward a minimum number of variables for explanation. All other things being equal, the simplest diagnostic methodology is the best.
5. The diagnostic methodology should always be planned with the thought of the quantification of all variables. Mathematics is one of the most precise and general languages available to man. The objective of research is to make the diagnostic methods publicly verifiable and easily repeatable. Quantification is necessary if these objectives are to be achieved.

   In aspiring to objectivity and quantification, one should not permit these aspirations to prevent the whole organization from being studied because of its present resistance to quantification. In the early development of a field of study, qualitative insights may bear much fruit (Mannheim, 1940). For example, Robert Oppenheimer makes a plea for the naturalistic methods and the use of qualitative description in research, and cautions against too early mathematicization. In this connection, one wonders about the relevance of von Neumann's recent findings that the human mind may be understood by mathematics *less* accurate than those presently required for available computers. Apparently the mind's ability to operate efficiently with a *less* accurate calculus gives it its distinctive human quality (von Neumann, 1958).
6. The diagnostic methods should be so generally applicable that they can be used to provide comparative data among different types of organizations (plants, banks, churches, schools, clubs, etc.). If possible, the same basic methods should be used in conducting comparative studies across different cultures.
7. The diagnostic methods should be flexible so that new insights can be easily incorporated. This requirement is especially important at the present state of development when the existing theories are extremely naive and the instruments available are gross and crude. More concretely, this means that a diagnostic method should (*a*) be derived from or at least related to a theory

and, (*b*) have the objective to eventually add to that particular theory.

8. The basic motivation a scientist has toward his work is the desire to understand (and, as a result, predict and control) the phenomena upon which he is focusing. He is interested, first, in knowledge (awareness of the order of his universe) and, second, in the practical applications of this knowledge. The practitioner may question this motive. However, the history of science is full of examples from which one may safely say the most practical and useful knowledge has come from research whose primary aim has been the addition to knowledge. In other words, the best guarantee the practitioner has for the development of useful knowledge is to permit the scientist to conduct research whose objectives are primarily those of the "scientific game." As Cohen writes, "Social science can thus in the long run best attain its goal only when those who cultivate it care more for the scientific game itself and for the meticulous adherence to its rule of evidence than for any of the uses to which their discoveries can be put" (Cohen, 1931).

    This is not to deny the importance of helping to improve the lot of mankind. It is simply to say that those who are actively engaged in improving human life draw heavily on the research pursued regardless of practical application (Bronk, 1949).

These then are some of the basic assumptions that are used in guiding the researcher in his selection, conceptualization, and study of problems. Time and space do not permit us to present a detailed discussion of how the theoretical framework and the guideposts are used to select the research instruments, define the questions to be studied, and analyze the data that are obtained.[19] For the purposes of this discussion, let us assume that an organization has been studied. It is a manufacturing plant of about five hundred employees whose disguised name shall be Plant *XYZ*.

A Possible Model for Analyzing an Organization

In the previous section, a theoretical framework and a definition of the nature of organization were presented. These two are very important in guiding the researcher in his analysis.

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[19] For those interested in a detailed discussion of these topics, see the author's *Theory and Method for Diagnosing Human Behavior in Organization, op. cit.*

From the theoretical framework at least four basic categories are suggested:

1. The demands made of the participant by the formal organization (includes job demand, policies, and practices).
2. The predispositions that the participants may wish to express while participating in the organization.
3. The informal activities that the employees create to adapt to the formal organization.
4. The administrations' reaction to the informal activities.

The definition of the nature of organization, on the other hand, guides us in how the four basic categories above are to be analyzed and conceptualized. For example, each category may be conceptualized as an organic part of the organization. If this is done, then it follows from the definition, that we must ascertain (1) the *objective* of each part, (2) the interrelationship of the parts that create a *pattern*, and (3) the processes by which the pattern becomes *self-maintaining*.

What kind of a model can we utilize which presents the basic categories as parts, interrelated into a pattern, self-maintaining, *and at the same time* does not do violence to the complexity and uniqueness of the organization being studied?

The latter requirement assumes, in effect, that the model should be subservient to the data. Making the model subservient to the data leads to the development of a rather simple, gross model which lacks the rigor toward which a respectable scientist aspires. I admit this, but believe that it is more respectable for a researcher to let known reality be his guide. Philip M. Morse makes a similar point when he notes that to understand certain problems, one must understand the pattern before the details (Morse, 1956). Slowly, as Kurt Lewin suggests, by successive approximations, a rigorous model will someday be evolved (Lewin, 1935). Once one has "arrived" by this path, one will not have to "return" to try to do something about variables left out.[20] Holding the above hypothesis, I find Karl W. Deutsch's definition of a model a useful point of departure. Deutsch defines a model as "a structure of symbols and operating rules which is supposed to match a set of relevant points in an existing structure of process" (Deutsch, 1952).

The model I intend to use is borrowed (more in spirit than in substance) from the physical sciences. It is the model of a system with an input, an output, and feedback to the input. This basic pattern is all I find myself able to borrow; certainly none of the quantitative rigor found in the physical science models is to be emulated. Never theless, I think the model will be useful as a device to help organize the complexity, lead to new insights, and make a few qualitative predictions.[21] As C. W. Churchman, R. L. Ackoff, and E. L. Arnoff suggest, all useful models are not necessarily mathematical, nor are they used for accurate prediction or calculation. There are many that in essence are diagrams enabling the researcher to bring together, from many different fields, knowledge about organization. They help to separate the trivial from the relevant (Churchman, Ackoff, and Arnoff, 1957). In the field of organizational behavior, where the researcher is constantly overwhelmed by the richness, depth, and complexity of the variables, such aid is not to be taken lightly.

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[20] For an interesting article related to this problem, see John L. Kennedy, "A 'Transition-Model' Laboratory for Research on Cultural Change," *Human Organization,* 14, (Fall, 1955), pp. 16–18.

Perhaps this is enough by way of introducing the model. Let us now turn to a *summary* presentation of the data on the nature of a specific organization, namely Plant *XYZ*.[22]

1. The input process[23]

All systems are assumed to have "openings" where inputs can be brought into the system. In Plant *XYZ* the intake activities are conducted in the personnel department (which is located away from the plant). There, all prospective employees are carefully interviewed and screened. Interviews with the personnel people suggest that all applicants are evaluated for such factors as "neatness," "seriousness of purpose," a "desirable amount of humility," etc. The applicant is judged by the interviewer on these factors primarily during the interview and by his previous work record. If the applicant has a long list of jobs and cannot give an adequate explanation, he is considered a poor risk.

The employees usually hired are—in the language of the personnel specialists—those who seem to be willing (1) to learn their new jobs reasonably quickly, (2) to produce adequately, (3) to attend regularly and on time, (4) to complain minimally, and (5) to get along with the management and the employees. In short, the primary purpose of the personnel function is to make certain that only those employees enter the system who will not upset its equilibrium.

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[21] See Deutsch's article cited above for an interesting discussion of the different functions a model may serve.

[22] See Figure 1.

[23] For a complete organizational analysis, discussion such as the one that follows would be required for every department. Then the sub-systems could be compared to the whole. In order to save space this discussion is concerned primarily with the high and low skilled workers and the management. This group comprises the majority of the employees of the plant.

2. The formal requirements of the high skilled sub-system (A)

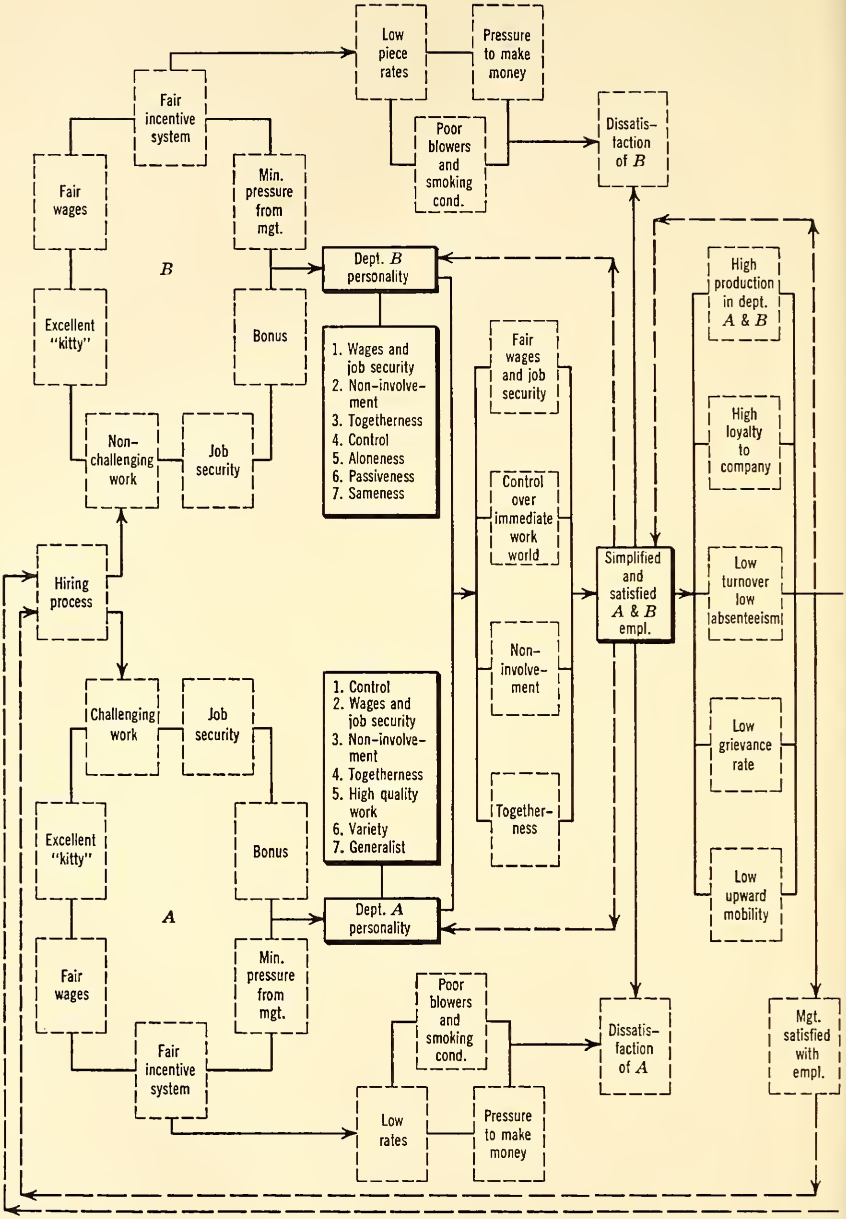
The individual passes through the intake process and enters one of two sub-systems: low skill (*B*) or high skill (*A*). If the individual enters the high-skill sub-system (*A*), he enters a world which according to the respondents has the following characteristics:

(*a*) Challenging work. Eighty-three percent of the employees in *A* report that they gain much personal satisfaction while working because they have challenging and creative work. Ninety-four percent describe their work as having "plenty of variety" or "as much variety as they can handle or more." A few qualitative examples are:

> I think the satisfaction I get is to know that I have done a job well. I like to do a perfect job; I like to feel something's really good; it's really perfect. When I take a look at a piece that I can tell has been made well, I get a real sense of satisfaction. But today, the way things go, you gotta rush, rush, keep an eye on the clock. If you don't, you don't eat.

(*b*) Fair wages, job security, and bonus. Ninety-nine percent of the employees describe their wages as "usually excellent, although because of the recession, they are now a little slow" and "could be better, but this is not a complaint, just a natural desire for more." The fact that the company does not have a history of layoffs especially during the depression is appreciated deeply by the employees (ninety-two percent). The bonus at the end of the year is also a feature very prominent in the view of the employees (ninety-two percent). The employees in *A* list "steady work, secure job, good wages, bonus" as the second important aspect they like best about the company.

(*c*) Fair incentive system. Almost all the employees studied are on individual piece-rate system. The rates for the jobs are viewed by the employees as fair. Of all the employees responding to the question about the fairness of the rates, only six percent say the rates are not fair. The remainder describe them either as "they're OK. I wish they were higher but then


Low piece rates
Pressure to make money
Fair incentive system
Dissatisfaction of B
Poor blowers and smoking cond.
Fair wages
Min. pressure from mgt.
B
Dept. B personality
Excellent "kitty"
Bonus
1. Wages and job security
2. Non-involvement
3. Togetherness
4. Control
5. Aloneness
6. Passiveness
7. Sameness
Non-challenging work
Job security
High production in dept. A & B
Fair wages and job security
High loyalty to company
Control over immediate work world
Hiring process
Simplified and satisfied A & B empl.
Low turnover low absenteeism
Non-involvement
Challenging work
Job security
1. Control
2. Wages and job security
3. Non-involvement
4. Togetherness
5. High quality work
6. Variety
7. Generalist
Low grievance rate
Excellent "kitty"
Bonus
Together-ness
Low upward mobility
A
Dept. A personality
Fair wages
Min. pressure from mgt.
Poor blowers and smoking cond.
Dissatisfaction of A
Mgt. satisfied with empl.
Fair incentive system
Low rates
Pressure to make money

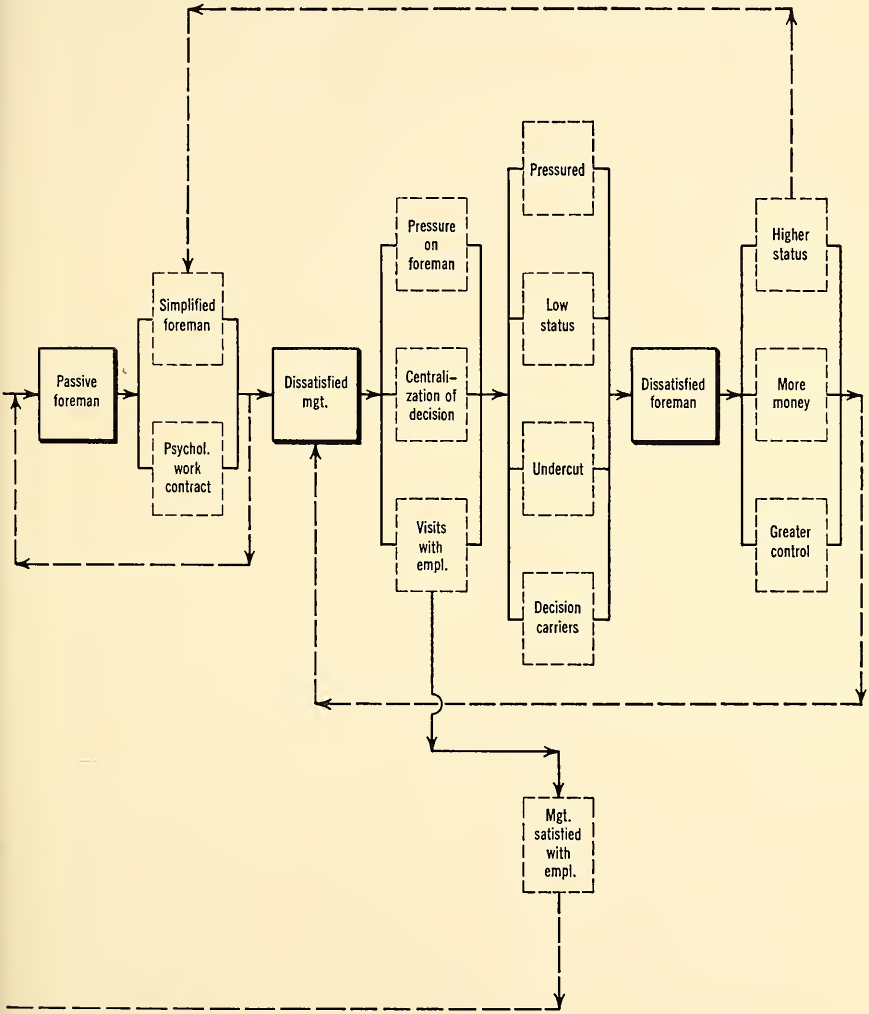

Passive foreman
Simplified foreman
Psychol. work contract
Dissatisfied mgt.
Pressure on foreman
Centralization of decision
Visits with empl.
Pressured
Low status
Undercut
Decision carriers
Dissatisfied foreman
Higher status
More money
Greater control
Mgt. satisfied with empl.

Figure 1. The social system of plant *XYZ*.

who wouldn't. That's natural," or, "some are tough, some are easy, the overall average are OK."

(*d*) The "kitty." In most cases all the employees interviewed are able to build up a "kitty." Some jobs are timed so that one can make quite a lot of money in one day if he produces to the utmost of his assumed capabilities. However, as in many plants, the employees restrict their *reported* production (Whyte, 1955). They do this simply by holding back "tickets" which they must turn in if they are to get paid. The ticket states how much the man produced of a particular item, the piece rate, the order number, etc. Thus if a man (and often his foreman) produces more than he feels is wise to turn in, he "banks" the tickets in his "kitty" and holds them until a day he may be assigned a tough job or when he may not be feeling well or when his machine may break down.

Ninety-seven percent of the employees report that the "kitty" is very important to them. It provides them a measure of control over their wage fluctuations and helps to guarantee them a steady take-home pay. The remaining three percent feel the same but add they do not make enough.

> A kitty is damn important and you put that down. If you're sick or have a rough day it helps you out. You can take it easy when you're not feeling too well, and still turn in and get paid a good piece rate.
>
> I think it's very important. With some jobs, you can't make a kitty. With others you can. Sometimes you get a job that's really rough. You know it and the foreman does too. So, you go ahead and lose and make it up by the kitty. A good foreman makes sure you get an easy job to make up for your loss.

(*e*) Minimum pressure from management. The employees in subsystem *A* report that there is minimum pressure from management. Thus, seventy-four percent report "management in this place is excellent." "They're wonderful people." "They hardly ever bother us, and we hardly ever see them." One hundred percent respond that the pressure from the leadership and the controls is at a minimum. One hundred percent report that they are their own boss on the job. The only pressure they really sense is during the rush season. The employees describe this pressure as fair. Finally, fifty-three percent of the employees report the thing they like best about the entire company is that the management is "friendly," "not chicken," and "does not pressure the employees."

3. *The formal requirements of sub-system (B)*

(*a*) Non-challenging work. Eighty-five percent of the employees report they are perfoming work that requires minimal abilities and offers little or no challenge. Eighty-seven percent view their work as "routine," "boring," "dull," and "non-interesting." Some qualitative examples are:

> If the work is all right then I make money, and that's my biggest satisfaction. If I don't, I get mad. What else is there to be satisfied about? I learned long ago the only thing you can get out of a good job is good pay.
>
> The only reason I work is to make more money. No other reason. Some guys (damn few) say they work for pleasure. They must be bats. How the hell am I supposed to get satisfaction from my job. I'd just as soon go out and dig holes, at least I'd be in the fresh air.

(*b*) Fair wages, job security, and bonus. Eighty-one percent of the employees report their wages are "usually excellent although because of the recession they are now a little slow," and "could be better, but this is simply a natural desire." As in the case of *A*, the lack of layoff is deeply appreciated (ninety-seven percent). "Steady work, secure job, good wages and bonus" is the feature the employees in *B* like best about the organization.

(*c*) Fair incentive system. The employees in sub-system *B* have basically the same incentive plan as does *A*. Sixty-eight percent believe the rates are fair. Unlike the employees in *A*, only ten percent view the incentive system as a cause of poor quality work. The difference is understandable because in *B* the employees work on semi-automatic machines where their role is primarily one of feeding the machine the raw product. They are not responsible for poor quality; the machine is to be blamed. The employees do blame management for not having a clear standard of quality for the poor quality (forty-three percent). The remainder blame the people in other departments.

(*d*) The "kitty." The discussion of the nature and functions of the "kitty" in *A* applies equally for *B*. The attitudes toward the "kitty" are also the same. Eighty percent of the employees believe the "kitty" is "very important" for them and they wished they could have a larger one. (Thirteen percent refused to comment.)

(*e*) Minimum pressure from management. The management practice of minimum pressure apparently is also to be found in *B*. Thus, seventy-one percent of the employees describe the management as "excellent." "They hardly ever bother us." Ninety percent report no pressure except during the rush season. Eighty-three percent report they are their own boss on the job.

4. The organizational predispositions[24]

A word about our use of the concept "predisposition."

For the sake of consistency and simplicity the personality aspects upon which we focus are all categorized as "predispositions." A predisposition is defined as a tendency to act in a particular situation. The predispositions are inferred from the interview data. The analyst combs the interview for any themes from which he can infer the desires that the participant wishes to satisfy while at work. (See footnote number 24). Every individual is assumed to have a number of predispositions that he wants to express *while a member of the organization,* each of which may vary in degree of importance (Lewin's potency). The potency may also vary within the same individual at different times in his life or different situations.

The degree of importance of each predisposition may be arbitrarily assigned the following numbers: Zero for no importance; one for regular importance (RI); two for high importance (HI); and four for extremely high importance (EHI). The potency of each predisposition is ascertained by analysis of the interview protocols. The analyst goes through each interview looking for content from which he can infer a predisposition. A standard scoring procedure is being developed in order to decrease as much as possible the subjective guesswork on the part of the analyst.

Let us now turn to a *summary* of the data. An analysis of the data shows, as one might expect, significant differences in predispositions, between employees in sub-systems *A* and *B*.

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[24] For a detailed discussion, see the author's *Theory and Method, op. cit.* A predisposition is not assumed to be as basic as the "needs" or "need systems" postulated by many psychologists. The psychologist's concept of "need" usually refers to those predispositions (to use our term for the moment) that are more genotypic. For example, usually the individual manifests those needs in many different kinds of situations. Our predispositions are limited to the organizational context being studied.

Briefly they are:

High-Skilled Employees	Low-Skilled Employees
1. Aspire for high-quality work, as well as for an acceptable rate of productivity.	1. Aspire primarily for an acceptable rate of productivity.
2. Express high interest in their work.	2. Express little interest in their work.
3. Express low emphasis on money (as long as present wages are viewed as being fair).	3. Express high emphasis on money (even though present wages are viewed as being fair).
4. Express a sense of self-worth related to their technical competence.	4. Express almost no sense of self-worth while at work.
5. Develop strong and lasting friendships.	5. Develop few strong and lasting friendships.
6. Participate in creative activities outside the plant.	6. Participate in non-creative activities outside the plant.

Perhaps less expected, however, is the finding that these predispositions were *not* crucial (or did not have high potency) for either the employees in *A* or *B*. Moreover, the *high-potency* predispositions in sub-system *A* are *identical* to those in sub-system *B*. They are the predispositions for Wages, Job Security, Non-involvement, Control, and Togetherness. These are defined as follows:

The need to experience:

Togetherness in relation to the other employees, i.e., the feeling that the employees like each other without knowing each other or experiencing close human relationships. The emphasis is on skin-surface signs of friendliness.

Wages which guarantee a fair standard of living and a secure job. The level of wages should be comparable for similar work in the community. The degree of security desired is to have a permanent job during the most difficult depression periods.

Non-involvement in the formal activities of the organization. They need not feel responsible for anything about the organization except their own specific job. Non-involvement does not include individual's attitude toward productivity. It includes such needs as not to become upwardly mobile, not to worry about the health of the organization, etc.

Control over one's own immediate work environment. This includes the need to be left alone by the boss and not to be pressured by the managerial controls or formal policies and practices.

These predispositions "fit" both sub-systems well. The management does not apply pressure on the employees. It does not require that the employees become highly involved in the formal controls. In fact, up until recently, it had few formal controls such as budgets. Also the management, through its intake process, emphasizes that it wants friendly employees who get along with each other and who do not complain. Togetherness is congruent with this requirement.

A fundamental assumption of an effective, individual piece-rate incentive system is that the employees will be predisposed to make money and desire secure jobs, and will not be greatly influenced by informal group standards. The emphasis on money and job security is mirrored in the needs of the employees; this prevents any cohesive group from forming that creates group standards. The rate-setting in this organization is primarily controlled by the employees' classic fear of overproduction. The foremen share these fears and actively set ceilings to production.

The reader may inquire, how do we really know the employees developed these needs to conform to the formal requirements *after* they entered the system? Is it not possible that the individuals had these needs before they entered the system? These are crucial questions and are not answered within the scope of this project. They require longitudinal studies of employees which begin before employees enter the labor market and which continue for the working life of the employee. Thus, at this time, conclusive replies cannot be given.

However, there are a few indirect indications to support the hypothesis that the employees develop needs according to the work world in which they exist. First are the comments made by the employees in *B* during the discussions about personal satisfactions. Nearly sixty-five percent gave responses from which the interviewer can infer the respondent is aware of the existence of more mature needs. Many employees (over fifty percent) made comments such as, "Are you kidding, Doc; what kind of challenges are there in these jobs. Any dodo can do them."

The second bit of evidence is that the high-skilled employees manifest a higher proportion of mature predispositions while the low-skilled employees manifest a much higher proportion of immature needs. If the predispositions were not a function of the working world, then would it not be valid to expect a more normal curve of distribution of predispositions within each sub-system? These bits of evidence although inconclusive may be suggestive.

5. The informal employee culture

If the predispositions are, as we hypothesize, important to the individuals, then we may hypothesize that the individuals will tend to try to guarantee their expression. From research on the relationship between culture and personality, we may hypothesize that one way in which individuals can guarantee the expression of their predispositions is to create a culture that sanctions and approves them.[25]

This is hypothesized to occur in Plant *XYZ*. The employees in both sub-systems create an "informal employee culture" which sanctions those predispositions that are common to their sub-systems, thereby making them cultural norms.

One further word about the predispositions which could not be discussed sensibly until this point.

With the exception of the predisposition "control," none of them seems similar to the predispositions in the personality model hypothesized in the previous section. This may mean that our personality model could be invalid or at best unnecessary.

Another possibility may also be inferred from our theoretical viewpoint. We note that individuals are hypothesized to adapt to the formal organizational requirements by creating informal activities. The informal activities in Plant *XYZ* are represented by the norms of the Informal Employee Culture. Is it not plausible to hypothesize that after many years in the system the employees would incorporate the norms of the informal employee culture? Once this occurred, the culture would then serve to define the predispositions for the old and the new employee (while at work).

If this reasoning seems valid, then is it not also valid to expect the employees who have incorporated these norms to report them to the interviewer as predispositions? Admittedly, all this is in the realm of conjecture, and again longitudinal studies are needed if these questions are to be answered systematically.

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[25] The inference that man creates culture and society to fulfill his needs is a basic conclusion of much personality-culture research. See, for example, C. Kluckhohn and H. A. Murray, *Personality*, Knopf, New York, 1949; E. H. Erikson, *Childhood and Society*, Norton, New York, 1950; J. Gellin (ed.), *For a Science of Social Man*, Macmillan, New York, 1954; R. Linton, *The Science of Man in the World Crisis*, Columbia University, New York, 1945; O. Klineberg, *Social Psychology*, Henry Holt, New York, 1940; T. M. Newcomb, *Social Psychology*, Dryden Press, New York, 1950; K. Lewin, *Resolving Social Conflicts*, Harper's, New York, 1949; H. S. Sullivan, *Conceptions of Modern Psychiatry*, The William Alanson White Psychiatric Foundation, 1711 Rhode Island Avenue, Washington, D. C., 1947; D. Snygg and A. Coombs, *Individual Behavior*, Harper's, New York, 1949; and H. L. Witmer and R. Kotinsky, *Personality in the Making*, Harper's, New York, 1952.

6. *Outputs of the informal employee culture*

In an industrial organization, management clearly has power over the employees. The employees, therefore, live in a world where their opportunity for expression of their predispositions would be immediately cut off, if the management decided to violate or even throw out the norms of informal employee culture. However, the probability that management would take such an action is small. They realize that as long as the culture is maintained the satisfaction of the employees will tend to be high.

High self-expression, in turn, leads the employees to behave in ways desired by management. It is as if the employees say, "Since management is respecting our self-actualization, we will respect theirs." Consequently, the people in Plant *XYZ* have a high production rate (in the eyes of management), are loyal employees, show low turnover rates, low grievance rates, and low upward mobility.

7. *Satisfied management*

Data available show that most of the top management is highly satisfied with the outputs of the informal employee culture. For example, two of the top corporate officers interviewed rate Plant *XYZ* as "the best" and three rate it as "one of the two best." All independently agree that morale is very high and that the supervision is much above average for the entire corporation.

Turning to the top five officials of the plant, we find that they believe the employees are the best producers in the corporation. They are so confident of their employees' motivation to produce that in response to the question, "How can this plant be made more efficient?" they reply, "By changes in methods, machinery, etc." "If the plant is inefficient," states one, "it is not due to the employees but due to the fact that we do not have enough work for them, or the production runs are too short, or our methods are inadequate."

The satisfaction of the management and employees with the system so far presented is hypothesized to feed back and to reinforce the hiring process thereby guaranteeing employees similar to those already hired. This action closes a circuit in the system and permits it to become self-maintaining.

However, we may not end our analysis at this point because there are further data that must be integrated into the system of the organization as a whole. Up to this point, we have simply described a subsystem of the whole.

8. Passive foreman leadership

Let us now turn to the foremen, all of whom have "come up from the ranks." If our analysis above is valid, it implies that the foremen's personalities must have been influenced by the informal employee culture.

When made foremen, they are told by management that they will be considered successful to the extent that they maintain high production, low grievance rate, and low absenteeism. The foremen realize that the way to get the employees to behave in this manner is to maintain the informal employee culture and not to behave in a way that violates the culture's norms. Thus, eighty-seven percent of the foremen report that in order to be effective, they must strive hard (1) to keep everyone busy with work that (2) guarantees a fair take-home pay, (3) to distribute the easy and tough jobs fairly, and (4) to leave the employees alone as much as possible. In short, a successful foreman from the foremen's point of view, is neither directive nor is he the expert in human relations that some imply he ought to be. The employees agree with this logic. Eighty-seven percent in *A* and *B* describe an "understanding" foreman in terms similar to those above.

9. Outputs of a successful passive leader

There are at least two resultants from the passive or "understanding" foreman leadership-styles. First is an employee-management relationship dominated by something we shall call the "psychological work contract." Second, a foreman who, as a human being and as a leader, becomes "simplified."

(*a*) Psychological work contract. Since the foremen realize the employees will produce best under passive leadership, and since the employees agree, a relationship is formalized between the employees and the foremen which might be called the "psychological work contract." The employee will maintain the high production, low grievances, etc., if the foremen guarantee and respect the norms of the employee informal culture, (i.e., let the employees alone, make certain they make adequate wages and have secure jobs). This is precisely what the employees need. Thus, the foremen's leadership behavior feeds back to guarantee the perpetuation of the employees' predispositions and their informal employee culture.

(*b*) Simplified foremen. The impact of the psychological contract is to coerce the foremen to mold their leadership pattern in terms of its requirements. But the requirements are not particularly difficult. Certainly, they do not require such complex human-relations skills as self-awareness, sensitivity, etc. The psychological contract simplifies the employee-foreman relationship. It also simplifies the foreman's leadership pattern and may simplify him as a human being.

10. *Dissatisfied management with foremen*

A (simplified) leadership pattern whose main characteristics are to interact minimally with, and not to pressure, subordinates, is apparently not appreciated by the upper management. They wish that the foremen manifest more active, striving, pressuring characteristics toward the employees. The foremen find it difficult to convince management that their passive leadership is more effective. Consequently they tend to become quite passive in their relationship with top management. If it is possible, they prefer (unknowingly at times) to get top management to make any decisions that are important. The four top executives in the plant report that the foremen are not of high caliber.

11. *Resultants of a dissatisfied management*

(*a*) Pressure on the foremen. Management reacts to the passive leadership by applying pressure on the foremen to make them, as one top executive said, "more alive, go-getting, and hard-hitting." The foremen feel the pressure. Although few employees report pressure from management, ninety-four percent of the foremen report such pressure. Moreover, seventy-seven percent report that they are never, or hardly ever, their own boss.

(*b*) Employee visits. Because the executives also do not trust the capabilities of the foremen, they constantly make visits throughout the plant. There is hardly a moment when the top plant executives are not walking through their respective departments. They tend to be friendly and chat with the employees. As one top executive put it, "I get an accurate feel for the morale of the employees with these visits, and I get it much quicker than it would come to me from the foremen."

12. *The foreman's job: pressure; low status; undercutting and decision-carriers*

If management visits act to increase employee satisfaction, they tend to increase the foremen's dissatisfaction. Many feel that they are undercut (seventy-seven percent). They feel not only that they are not trusted; they feel also that their jobs are menial with not much responsibility. Sixty percent describe their work as "completely routine," "dull," "non-challenging," or "routine with variety once in a while."

13. *Foreman dissatisfaction*

We may now infer that the foremen's dissatisfaction is caused primarily by four factors. They are pressure from management, low status of their job, undercutting, and their role as decision-carriers rather than decision-makers.

14. *The resultants of the foremen's dissatisfactions*

(*a*) A desire for more money.
(*b*) A desire for higher status.
(*c*) A desire for greater control.
(*d*) Reinforcement of the simplified personality.

15. *Reinforcement of management dissatisfaction with the foremen*

The resultants of the foremen's dissatisfaction by no means please management. They feel that the foremen are not facing reality, if they think that the best way to adapt to management's pressure is to become even more "simplified," dependent, and submissive, while at the same time asking for higher control. Thus, the foremen's adaptive activities reinforces the management's feelings of dissatisfaction which only serves to increase the management's pressure, employee visits, etc. The "management-foremen" circuit is now closed, and we have a self-maintaining system. This leaves the management with the employees as their major source of satisfaction, which in turn, feeds back as another reinforcement of the particular hiring process now being used (which management views as highly responsible for the type of employee now working at Plant *XYZ*). The feedback completes the circuit to the input process, and we have a self-maintaining system.

The requirements of the two models—to use all four basic categories, and to show how they are interrelated into a pattern and are self-maintaining—have now been illustrated.[26]

The Usefulness of Organizational Analysis

There are at least two tests of usefulness of a model of organization. One is the extent to which it serves to deepen one's understanding of the organization. The second, and a resultant of the first, is the new predictions that one is able to derive which subsequently might be verified.

In this section a few examples of the usefulness of the framework are presented. The first is an example of the deepening of our understanding of the organization. The others are examples of concrete predictions about future human behavior in the organization that is independent of this analysis.

1. *Quantifying the individual's degree of self-actualization*

One of the central problems of organizational theory is understanding the individual's self-actualization within the organization.[27] One major stumbling block is the difficulty of ascertaining precisely what an individual does desire to actualize while at work. It has been the belief that trying to ascertain the predispositions of individuals is too complex a problem, especially for large numbers of cases. It is thought, on the assumption of individual differences, that the number of predispositions would be unmanageable. Compounding this problem is the one of depth. How "deep" does one delve into the individual personality to understand it sufficiently in order to make valid predictions about organizational behavior?

Beginning with the former problem, there are a number of forces acting to decrease the heterogeneity of the predispositions manifested by individuals. First, the very function of organizational structure, managerial controls, leadership, job descriptions, policies, and practices is to require psychologically different people to behave in remarkably similar ways. For example, ten supervisors who can be shown to have different personality patterns (on the basis of projective tests) behave similarly when they are in the plant manager's office (Argyris, 1953).[28] In another example, researchers have shown that the assembly line (or other types of technology) coerces psychologically different employees to behave in a similar manner.[29] It is results such as these that may help to explain why the total number of different needs found to exist in a bank (300 employees), a hospital (250 employees), and in this manufacturing plant (400 employees) does not exceed twenty.

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[26] The writer wishes again to remind the reader that the above represents a summary of the data collected.

[27] Recently the writer has noted the work of Blum, who seems to be one of the few trying systematically to quantify the individual's *and* the organization's actualization. See, for example, "Social Audit of Enterprise," Harvard Business Review, 36, No. 2, pp. 77–86.

In discussing the problem of depth one must differentiate between those who find opportunity while at work to express large portions of their personality (usually management) from those who do not usually obtain optimal self-actualization (the lower-level employees). Lower-level employees, as is shown in this study, express so little of their personality while at work that one does not have to go very much in depth to understand their behavior relevant to *the organization setting.* However, when one interviews executives who work in a world characterized by interpersonal relationships that involve their whole personalities, deeper studies (including psychological tests) may be necessary, if a full understanding is to be obtained.

Knowing the predispositions of individuals is only half the task. One must know also the demands that the organization makes upon the individuals in order to compute the probable degree of expression the individual will obtain.[30] The model presented in the previous section, which purports to include the relevant demands of the total organization upon the individual, serves the purpose. (It is relevant for understanding self-actualization.) Then, combining the system of ascertaining personality predispositions with the model of the system, it is possible to ascertain and to quantify, although crudely, the probable degree of self-actualization of any given employee on any level.

The first step toward quantification is to define a scale of the degree of self-actualization with the organization:[31]

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[28] For a systematic discussion of this phenomenon, see the discussion of "Behavioral Settings" by Roger G. Barker and Herbert Wright in *Midwest,* Row, Peterson, Evanston, Illinois, 1954.

[29] See the work of the Technology Project at Yale University, and Professor Leonard Sayles at Columbia.

[30] For an excellent study of personality assessment where the environmental demands are systematically understood, see George G. Stern, Morris J. Stein and Benjamin S. Bloom, *Methods in Personality Assessment,* Free Press, Glencoe, Illinois, 1956.

[31] The scales described in this paper admit only to ordinal properties. Thus, the numbers 0, 1, 2, 3, are to mean nothing more than that 1 is larger than 0; 2 is larger than 1; 3 is larger than 2. The zero point is defined as that point where the individual reports absolutely no expression of the factor being con-

0. *zero* when that individual reports (or which we can infer that he perceives) no expression of his personality requirements.
1. *minimal* when the individual reports that he is obtaining some personality expression, but that it is not adequate.
2. *adequate* when the individual reports that he is obtaining adequate personality expression.
3. *maximum* when the individual reports that he is obtaining adequate personality expression as he desired it.

2. Constructing the individual's self-actualization score

In order to arrive at an individual's self-actualization score, *each interview* is individually analyzed and scored as follows:

1. Analyzing each interview, list all the predispositions that the individual reports (or the researcher infers) that he desires to express.
2. To the right of each predisposition list the reported (or inferred) degree of expression of the factor, using the scale above as the guide. This may be called the "Actual Expression" (AE).
3. Multiply each AE score by the potency (P) that the predisposition has for the individual. [Regular $= 1$; very high $= 2$; and extremely high $= 4$ ($AE \times P$).]
4. Total the column of ($AE \times P$) scores.
5. Then list the maximum possible score of each predisposition which in all cases is 3 (ME).
6. Multiply this score by the potency ($ME \times P$).
7. Total the ($ME \times P$) column.
8. Then place the result of ($AE \times P$) over the results obtained by ($ME \times P$).

The number obtained is simply a score. It serves to place the individual on a position in a scale ranging from zero to one. If *A* has a score of .60 and *B* has a score of .30, all we may say is that *A*'s score is high; but we may not say that *A*'s score is twice as high as *B*'s.

3. The self-actualization scores

From the discussion in the previous section one might conclude that the self-actualizing scores will be high. This is confirmed by the examination of the frequency distribution of the scores.

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sidered. The writer recognizes that, strictly speaking, one should not add or multiply numbers not on internal scales. But, the result seems useful and, as Marion Levy has suggested, one may have to "sin bravely" for progress to occur.

Table 1

Frequency Distributions of Self-actualization Scores
in Subsystems *A* and *B*

(in percent)

	Dept. *A*	Dept. *B*
0–49.0		
50–54.5	2.9	1.1
55–59.5	2.9	1.1
60–64.5		3.3
65–69.5	5.9	8.9
70–75.5	5.9	16.7
75–79.5	8.8	11.1
80–84.5	23.6	16.7
85–89.5	20.6	21.1
90–94.5	14.7	10.0
95–100	8.8	10.0

4. The operational validity of the actual expression scores

An important question that must be asked is how do we know that the degree of expression (*AE*) assigned to each predisposition is valid? In order to test the validity of the actual expression scores, a random sample of twenty-five interviews was given to two professional social scientists. They were asked to study the model of the social system (given in the previous section). They were then asked to make a judgment as to the actual degree of expression of the predispositions in each interview. The judges were in agreement with each other in sixty-nine percent of the cases. The agreement between each judge and the writer was seventy-three percent and seventy-six percent respectively. These data lead us to conclude that the operational validity of the scales used above is adequate enough to warrant further study.

5. The predictive validity of the self-actualization scores

It would increase the value of the self-actualization scores if something could be predicted from them that is independent of the data already gathered. This would mean that the self-actualization scores have predictive validity. In two other organizational studies conducted by the writer where the turnover was high, the scores were used to predict who would and who would not leave the organization on their own motivation.[32] The results in those two organizations indicated the scores have a high predictive validity. Such a test is not strictly possible in this study because the turnover is almost nonexistent. The low turnover found in Plant *XYZ* would certainly be predicted on the basis of the scores provided in the table above. In this sense, the predictive validity is high. However, for a rigorous test, the scores should be subjected to a test situation where there is a high turnover rate. This would provide ample opportunity for the scores to fail if they were not valid.

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[32] See the author's study of the bank and the hospital previously mentioned.

6. Predictions regarding the impact of change

From the model in the previous section we concluded that the employees' behavior is guided primarily by the informal employee culture and the psychological work contract.

If these conclusions are valid then the following hypotheses may be stated:

(*a*) Since the predisposition of Wages and Job Security is an important one for the employees, they will tend to accept change as long as it does not decrease their wages and job security.
(*b*) Since the predisposition of Non-involvement is an important one for the employees, they will tend to accept changes *without* desiring to participate in the planning of these changes.
(*c*) Since the predisposition for Control is an important one for the employees, they will initially be annoyed with changes in their work, but this annoyance should decrease as the employees gain control over the new job.

An opportunity to "test" these hypotheses arose in one of the high-skill departments. In this department the employees produce "total" products primarily by hand. The level of skill is among the highest in the industry. It would easily be comparable to master glass blowers in the glass industry.

The management decided to mechanize the production of a particular product in order to cut the costs and, hopefully, the price. No opportunity was given to the employees to participate in planning the change. It was simply announced to them that such a change was being planned. Nothing else was communicated to the employees until the new work process was developed and ready to be installed. At that time the men were shown the new process, a lecture was given to them, and a short demonstration made. The new process required so little skill that relatively untrained female employees could perform the work with little training. Thus the change is very significant in terms of the decrease of skill required.

On the basis of our analysis, resistance to change should be due to fear of job security, a decrease in wages or loss of control, and *not* due to such factors as lack of participation and involvement in the change process.

The results were as predicted. Ninety-three percent of the employees reported initial fear of loss of wages.[33] These fears were quickly overcome because management had purposely set loose piece-rates so that the men could earn their accustomed wages, or more, with little effort and even during the learning period. However, the fear of job insecurity increased somewhat, because the employees now felt that with more of the product on the market (even at a lower price) they were even more at the mercy of the sales department than before.

During the interviews eighty-three percent of the employees responded that they did not care that they were not included in the planning of the changes. "That is management's worry," commented one employee. Moreover, ninety-two percent of the employees viewed the changes as necessary, if the company were to remain in a good competitive position.

The only complaint mentioned by the employees was that the quality of the product was reduced by the new semi-automatic process. Fifty-five percent decried the de-emphasis of quality work. This complaint is also predictable from our knowledge, that employees in *A* are predisposed to high quality work.

Finally, a somewhat unexpected finding, *none* of the employees complained about the fact that their jobs had been "de-skilled." The interviews show that the employees do *not* feel their original jobs are de-skilled. They view that the company is simply paying them these wages to perform different work.

An illustrative comment is:

> I think management introduced the merry-go-round [the nickname given to the new process] correctly. There's no need in calling the people in and wasting a hell of a lot of time. You tell them what you plan to do, you guarantee their pay, you guarantee their job security, and then let them think about it. When you're ready you put it in. Sure they complain a little bit, but it's quieted down now.

7. The impact of change on the total system

An organization is defined as a pattern of variables tending toward stability or equilibrium. Since the model represented in the previous section purports to conceptualize an organization, it follows that the system represented must tend toward stability and equilibrium. It can be further hypothesized that any changes desired to alter significantly any of the variables presented in the model or their position will tend to be resisted by the system.

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[33] $N = 30$.

A change that implies basic alterations of the system has just been introduced into the organization. It began about the time when half of the employees had been interviewed. The change is the introduction of a budget system to control costs more rigorously.

The philosophy and impact of budgets is already documented in previous studies. Some of the main points are that budgets (1) apply never-ending pressure, (2) continually raise production goals and cut freedom for error, (3) increasingly tighten piece-rate systems, (4) strive to eliminate informal activities such as the kitty, (5) continually place line people in psychological failure, and (6) lead to interpersonal hostilities among managerial personnel (Argyris and Miller, 1951).

If this philosophy is held by the budget people in this organization and if the impacts above do occur, then clearly the system will be pre-assured by the budgets to change. More specifically the management will be forced to increase its interaction with and pressure on the foremen to "tighten up." Should this behavior occur, it will only serve to increase the foremen's discontent, desire for money, and feelings of second-class citizens.

The foremen, we predict, should resist passing the pressure down to the employees. Budgets violate the psychological contract. Pressure, increased interaction, tightening up on piece rates, and elimination of the kitty would lead to dramatic changes in the system. The foremen, recognizing this possibility, will tend to resist budgets.

But, since the pressure emanated from management and since they are expected to be loyal to management, it will be difficult for the foremen to resist openly.

We may further hypothesize that management's *low* evaluation of the competence of the foremen will tend to delay the effective operation of the new budget system, thereby making the change *easier* for the people. Thus the foremen can complain that the budget system is too complex and consequently it will require much time to be introduced. The management, in turn, perceiving the foremen as not being particularly bright, will tend to accept these excuses and lower the foremen's level of aspiration as to the time and change it will require. Here we have an example where the disrespect of individuals may be healthy, from the viewpoint of organizational equilibrium.

Unfortunately, because the introduction of the budgeting process has been so recent, not enough data are available systematically to test these predictions. However, the data that are available indicate support for the analysis. They are presented as illustrative. Much more data are necessary, if the hypotheses are to be subjected to a test.

Interviews with the three top-management personnel suggest that foremen are complaining that budgeting is too complex. The managers report that this is expected since, as one put it, "our foremen have never had budgets and of course they're not so bright."

Observations of two budget sessions show clearly that the foremen *are* being pressured and that they counteract with silence and with careful digs at the budget system, and excuses.

Interviews with four of the foremen (two of whom are perceived by management as being weak) report that the foremen are having difficulty with budgets, but they report their difficulties to the top management. The foremen report that they fear what will happen if the employees see their budgets as pressure devices. As one puts it:

> Jeesuz, I can't use these goddam things as the bright boys upstairs think they can be used. Why if I take one of these damn things to the boys in Department *A*, most of whom have been in this company over ten years, they'd tell me to shove them.

Another said:

> It's easy for them guys to talk about modern methods of control. But, have they ever tried to put those things across to people who never had to use budgets and who have been led by bosses who wouldn't give a good damn for budgets. I wonder what the hell will happen as the pressure grows. And it will. I asked another foreman in Company *X* if his experiences are typical; we haven't seen nothing yet.

Interviews with three budget-control people leave no doubt that they believe the organization can be tightened up much more. The top budget-people express disgust with the length of time it is taking to really use budgets as they wish. As one put it, "Someday someone is going to have to light a fire cracker under somebody's rear. All we hear is excuses and all we get are delays. Look here, take a look at these figures . . . ."

Although the data above indicate a trend congruent with the one hypothesized above, it is still too early to present systematic evidence. However, they are presented to lend support to the suggestion that the model can be used to predict the impact that budgets will tend to have on the system.

It is hoped that these examples illustrate the view that the model is of value in furthering our understanding of human behavior in organizations.

8. The nature of the questions asked by the approach

A few comments are in order here regarding the boundaries of the nature of the universe implied in the position taken above. It might be helpful to differentiate the universe by defining some typical questions that might be considered central to what has been called organizational behavior:

1. How do human (or social) organizations arise? Do they evolve over time? Do they develop suddenly? Slowly? Are both possibilities possible? If so, under what conditions will organizations evolve and under what conditions will they be suddenly developed?
2. What is organizational growth? Do organizations have a growth pattern "inherent" in the nature of organization? How do organizations grow?
3. How do organizations maintain themselves internally and still adapt to the external environment in which they are imbedded? By what processes do organizations significantly alter the environment? Also, by what processes does the environment alter significantly the internal make-up of the organization?
4. Does the nature of organizational objectives influence significantly the creation, growth, and self-maintenance of the organization?
5. Are there generalizations possible regarding the processes of organization construction and disintegration? Is it possible (and fruitful) to conceive of criteria for "healthy" or "effective" organization as well as "unhealthy" or "ineffective" organization, for "tired," "rundown," "anemic," etc. organizations? If so, does it mean that one might be able to define when "chemotherapy" is needed and when "surgery" is required? What would "organizational rest" be? What would organizational stress look like?[34]
6. Are there generalizations possible regarding the patterns of organization? For example, are the possible number of significantly different patterns finite or infinite? If they are finite, what knowledge is necessary to discover the total possible number of cases? If they are infinite, then what possibilities for scientific generalizations exist?
7. Are there generalizations possible regarding the nature of parts when they are "organic" parts? For example, many individual personalities are part of an organization. Is it possible that the very nature of organization coerces "different" people to behave relatively alike? If so, would this lead to generalizations regarding the probable range of "styles of living" within an organiza-

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[34] Hans Selye (1956) suggests that it is meaningful to speak of a general stress syndrome.

tion? Similarly, are there generalizations possible regarding the nature and function of informal groups and of norms when they are (organic) parts of an organization?

8. What is the nature of organizational cohesiveness? How can it be measured? What inhibits and what facilitates organizational cohesiveness? What is the relation between (various degrees of) organizational cohesiveness and organizational effectiveness?
9. Finally, much research is required to ascertain if there are any generalizations possible about behavior that characterizes "feeds-upon" and behavior that characterizes "feeds-back" processes. To put it another way, is there something in the nature of "feed-back" processes that will behaviorally differentiate them from the "feed-upon" processes?

The questions above focus on the organization as a whole. Very little is asked about its environment. The omission of the environment does not imply that organizations are relatively closed systems, unaffected by their environments. Nothing could be further from the truth. Organizations are open systems continually influencing and being influenced by the environment.

The lack of discussion of this very crucial area is due to the writer's limitations. He finds it difficult enough to study organizations as a whole, no less so to focus with equal rigor upon the environment problems of the organization. It is acknowledged, however, that a complete organizational theory will require that the organizational and environmental studies be integrated.

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WILLIAM FOOTE WHYTE

6.

An Interaction Approach to the Theory of Organization

MY PURPOSE IN THIS ARTICLE IS—

1. to present a general model for the analysis of human relations in organizations, and
2. to examine some specific applications of this model.

At this point, I am not attempting to prove anything. The cases will simply be illustrative of what seem to me the possibilities of the model. The model itself is crude at this stage. I hope to be able to refine it in later writings.[1]

[1] Many of these ideas presented here are developed more fully in my *Man and Organization: Three Problems in Human Relations in Industry* (1959). That book is based upon three lectures, sponsored by the Lincoln and Therese Filene Foundation, delivered for the Human Relations Program of Dartmouth College. Permission by Richard Irwin and Company and Dartmouth College to use some of this material in its present form is gratefully acknowledged.

The Model

The theoretical model is shown in Figure 1.

I shall begin with three concepts: interaction, activities, and sentiments, which I take to be mutually dependent, each upon the other two, and any one of which may be modified by forces in the environment. I shall deal with these aspects of the environment: social and cultural, technical and physical, legal, and economic.

The three social system concepts I define in this way:

Interaction refers to interpersonal contacts. We can observe and even measure how often *A* interacts with *B* and how long each interaction lasts. We can also note whether *A* or *B* initiated the interaction and, for a given time period, what proportion of the interactions between them were initiated by *A* and what proportion by *B*. We can do this for pair events (involving just two individuals) or, to use the terminology of Chapple and Arensberg (1940), set events involving three or more individuals. We can also seek to determine

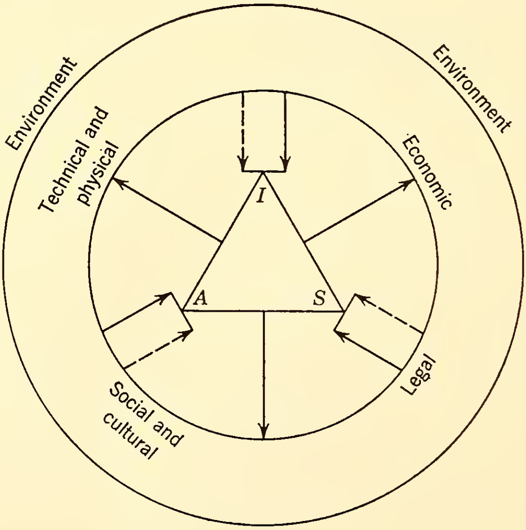

Figure 1. The diagram represents *I* (Interaction), *A* (Activity), and *S* (Sentiments) in mutual dependence with each other and in relation to the forces of the environment. Environmental forces may have an impact upon the social system of any of the three points. The impact may come directly (solid line) or symbolically (dotted line). The outwardly pointing arrows indicate that the social system has impacts upon the environment.

whether, in their interaction, *A* has initiated a change in activity for *B*, although here we run into some methodological and theoretical problems that I shall discuss later.

By *activities*, I mean the things that people do, i.e., the physical acts they perform. Activities can be observed and, in some cases, we can find indices for their measurement. For example, the work that employees in a factory perform is one type of activity, and the indices in this case are the production figures of the individual or the group in question.

By *sentiments*, I refer to the way individuals feel about the world around them. Sentiments have three elements.[2]

1. An idea about something or somebody, i.e., a cognitive element.
2. Emotional content or affect.
3. A tendency to recur, upon presentation of the same symbols that have been associated with the sentiment in the past.

As the definition suggests, I am not concerned with momentary or fleeting reactions. Probably we shall only be able to deal systematically with those personal reactions which manifest some stability.

By mutual dependence, I mean that a change can be introduced into the interaction-activity-sentiment system at any of the three points, and such a change will effect changes in the other two. I assume that in an organization interactions are not a random matter, but that they tend to develop a regular pattern. A change in this pattern of interaction can be expected to lead to changes in activities and sentiments. Similarly, activities in an organization tend to take a patterned form, and changes introduced into this pattern tend to be accompanied by changes in interactions and in sentiments. As the sentiments individuals have toward each other, toward the organization, and toward their work undergo changes, we can expect to see changes in interactions and activities.

This is not a self-contained system. For a work group whose behavior we are trying to analyze, changes can be introduced through the forces affecting this group in the environment. The impact can come directly or symbolically. For example, changes in the technical and physical environment, such as new machines and a new organization of the work-flow, will have a direct effect upon the activities and interactions of the workers involved. On the other hand, the establishment of a new incentive rate for this work group or for a neighboring group will not have a direct physical impact upon the group but will have its impact through symbolic channels, as will be discussed later.

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[2] For this definition, I am indebted to Alexander H. Leighton.

Readers will, of course, note the similarity between this model and the theories of George C. Homans. That is hardly surprising, since we come in a sense out of the same intellectual tradition—Harvard in the late 1930's when Chapple and Arensberg were developing their first statement of what has come to be known as interaction theory. Homans stated some of our main theoretical ideas much more systematically than they had ever been presented before in *The Human Group* (1950). I am here undertaking a modification of the statement as presented in that book, with the hope of opening the way to further theoretical advances.

It may be helpful at this point to indicate specifically where I follow Homans and at what points I differ. I am using the same three major concepts: interaction, activities, and sentiments. The first two I define just as Homans does. In *The Human Group,* he has a much more inclusive definition of sentiment, using the term to refer even to such bodily states as hunger, fear, and so on. However, in later writings he uses a definition of sentiments that is focused upon interpersonal relations and is quite in line with the one given above.

Readers will note that I have eliminated the Homans' distinction between the external and the internal systems. According to Homans (1950),

> The external system is the state of these elements (interaction, activities, and sentiments) and of their interrelations, so far as it constitutes a solution—not necessarily the only possible solution—of the problem: how shall the group survive in its environment? We call it external because it is conditioned by the environment; we call it a system because in it the elements of behavior are mutually dependent [p. 90].

He defines internal system as "Group behavior that is an expression of the sentiments toward one another developed by the members of the group in the course of their life together."

I am abandoning this two-system approach, because I do not feel that we can objectively and observationally distinguish between them. We may be able to distinguish fairly objectively between the activities that the individual must perform in getting his job done and those that arise out of his association with fellow workers. In practice it becomes much more difficult to make such distinctions with interactions because, as people interact on the job, they are often communicating about work and other matters at the same time. With sentiments, the external and internal seem to me even more inextricably mixed together.

The reader will note also that I have added two forces in the environment, not considered by Homans: the legal and the economic. By legal, I am referring to the rules and regulations of the institution itself and of the larger society of which it is a part. By economic, I am referring to the institution's system of wages and salaries, including incentives and bonuses. In seeking to use Homans' scheme on cases, I have found a need to consider these additional environmental forces. Others may find further categories of environmental forces that need to be included. However, I think it is sounder procedure to add categories as research makes it necessary, rather than to undertake the presentation of a complete catalog of all possible environmental forces.

The Impact of the Environment

I shall illustrate here the impact of technical and physical forces upon the social system. Examples of the impact of economic and legal forces will appear later in the discussion of *Patterns of Sentiments.* Examples illustrating the impact of social and cultural forces have been described in some detail elsewhere.[3]

I take the technical and physical forces to include the formal organization structure,[4] the technology, the work-flow, the layout of machines or processes, the allocation of tasks, and the physical conditions and requirements of work.

The impact of some of these forces of the environment upon the social system can best be shown by several examples.

As examined by Charles Walker, Robert Guest, and Arthur Turner (Walker and Guest, 1952; Walker, Guest, and Turner, 1956), the automotive assembly line has some clear-cut and drastic effects upon the social system. In the first place, it restricts and channels interaction among the men. While he is on the line, the individual can only interact with the man immediately above and the man immediately below him in the work-flow, plus sometimes the man on the other side of the line. The activities of the worker are, of course, controlled within very narrow limits by the technology and the work-flow.

The technical and physical forces also have a marked effect upon the foreman's interaction with the men. Observation shows him to be moving constantly up and down the line, interacting with a large number of men but for exceedingly short periods of time—forty-five seconds, on the average, for line subordinates. It was observed also that interaction was initiated more often from workers to foreman than *vice versa,* as Peter Blau (1957) has suggested. The explanation of this ratio of interactions seemed to be that the control of the men was provided by the technical and physical forces, with little intervention from the foreman, while frequent minor technical difficulties which occurred on the line moved the workers to call on the foreman for action.

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[3] *Man and Organization.* See Acknowledgment, footnote 1.

[4] For illustrations of this impact, see *Man and Organization.*

Systematic interaction measures have not been made for foreman-worker relations in other types of organizations. However, even casual observation of that relationship in, for example, a department of skilled maintenance men indicates that there the interactions are much less frequent but of a much longer duration.

Most human beings seem to find the assembly-line environment an exceedingly severe one. Usually the work is physically taxing and workers resent the routine nature of the job, the restraints upon physical freedom, and the lack of opportunities for interaction. This leads to negative sentiments toward the job, and this, in turn, seems to affect worker sentiments toward higher management and the company in general. The foreman, for whom they initiate more than he does for them, is not necessarily caught in this web of negative sentiments. He may be viewed as a good guy who is caught in the machine just as they are.

The impact of the technical and physical environment can be observed at any level of the organization. Consider this example of work-flow problems (Chapple and Sayles, 1958):

> In another manufacturing company, the general sales manager and the credit manager, who reported to the treasurer, were constantly at loggerheads. The sales manager complained to the general manager that the credit department was constantly interfering in the sales effort—refusing credit to old customers, writing letters at cross-purposes, and upsetting sales in general. The credit manager retorted that management had given him the responsibility for sound credit policies and that the sales department was violating them by trying to get orders passed through on poor risks. The battle became so intense that the general manager had just about decided to let at least one of the men go.
>
> After it was found that there were no major personality problems or temperamental reasons for the incompatibility, an analysis of the work-flow through the two departments was made. This revealed that orders were first processed in the sales department and then sent to the credit department for the customer's credit rating to be checked. As a result,

> a customer might receive an acknowledgment from the sales department leaving him with the impression that his order was being attended to, and a day or so later another letter from the credit department to the effect that the order could not be shipped because of his poor credit rating. Changing the work-flow so that all orders went first to the credit department, then to the order editor to check whether the order could be filled, and finally to the sales department, eliminated the conflict which management had attributed to incompatible personalities.

The importance of the work environment is strikingly demonstrated in two significant books which have been recently published on the subject.

Zaleznik, Christenson, and Roethlisberger—with the collaboration of Homans (1958)—have shown that it is possible, with an impressive degree of success, to predict the structure of informal group organization of workers and of group leadership in a department, when one knows the technology, the layout of the department, the placement of workers at work stations, and the pay system of the department, plus such objectively identifiable factors that the workers bring into the system as their age, sex, education, and ethnic identifications. They have not been nearly so successful in their attempts to predict satisfaction and productivity from the same data. However, even here they have developed some interesting theoretical statements that may yet prove of great value.

Leonard Sayles (1958) has been impressed by the apparent similarities in behavior of groups doing the same type of work in the same technological environment in different plants and companies. Kerr and Siegel (in Kornhauser, Dubin, and Ross, 1954) earlier made the same type of observation in their paper "On the Inter-Industry Propensity to Strike." Sayles argues that these environmental factors tend to condition the behavior of work groups: the technology, the organization of the work (individual jobs, a team of men all doing the same thing, a hierarchically organized team, an assembly line, and so on), the level of skill, and the range of pay within the work group. On the basis of accounts he has received regarding the behavior of more than two hundred work groups, Sayles has developed his fourfold classification of apathetic, erratic, strategic, and conservative groups.

It seems to me highly unlikely that this type of classification will stand without modification from further research. However, I am convinced that the factors Sayles is considering are of tremendous importance in molding work-group behavior, and that he has pushed us ahead in a highly fruitful direction.

Whatever the ultimate fate of the scheme of classification, some of the ideas underlying it are bound to be of significance. For example, I have found the concept of "resonance" highly useful. The idea is simply that when the work group is relatively undifferentiated as to tasks performed, pay received, and working conditions faced by individual members, it is highly likely that the problems faced by any one individual will be perceived as similar to the problems faced by other members of the work group. In this situation, as one individual gives voice to his sentiments, he is likely to find other individuals echoing the same sentiments and thus reinforcing his own. The factor of resonance in this situation tends to facilitate the formation of a cohesive work group which acts in a unified fashion in relation to management and the union. On the other hand, when the department in question is highly differentiated as to jobs, pay, and working conditions faced, the individual worker tends to find little resonance for expression of his sentiments on his problem, and the members of the department have difficulty in acting in concert.

This suggests one of the reasons why in the past we have had such difficulty in predicting behavior on the basis of a study of attitudes or sentiments.

We have known that what the individual will do depends upon what his associates feel and want to do, but we have had no systematic way of dealing with this phenomenon. For organizational studies, Sayles is pointing out how we may look at behavior in terms of a structure of sentiments as well as the structure of interactions and activities.

Patterns of Interaction

As is to be expected, theorists who have built their scheme of analysis around the concept of interaction have given primary attention to the impact of interaction upon sentiments and activities. We have been concerned with two general questions: (1) What pattern of interaction tends to be associated with what pattern of sentiments and activities? (2) How can we effect changes in sentiments and activities by introducing changes in interaction?

In seeking to answer these questions, we have not been concerned solely with the frequency, duration, and initiation of interpersonal contacts. Within these interpersonal contacts, we have also been seeking to develop rough measures of the frequencies of attempts, through interaction, to introduce changes in the activities of other people. We have given our attention here to two fields of study: relations up and down the hierarchy of the organization; and relations between management and the union.

It is one of the best-substantiated propositions in supervisor-subordinate relations that the sentiments between the two depend in an important part upon the ratio of initiations of activity-change from one to the other. This does not mean that favorable sentiments from subordinates to superior depend upon an approximate balance in the initiations between them. What the appropriate ratios are must depend, to some extent, upon the impact of environmental forces, as we have seen in the assembly-line case. Clearly, our formulations here are exceedingly crude. However, we seem to be able to make valid discriminations as we look at extreme cases. Whenever we see a high frequency of initiation down the line and little or no initiation upward, we always find workers expressing dissatisfaction with their superiors—and generally with other aspects of the work situation also. If we find, on the contrary, that subordinates are initiating upward for a significant portion of the time, then we tend to find quite different sentiments expressed toward the supervisor.

We need to look at initiation in both directions. We might at first be inclined to assume that subordinates do not express favorable sentiments towards superiors unless they initiate to them fairly frequently. In the study reported in this book, Chris Argyris describes a situation in which workers rarely initiated upward and yet expressed favorable sentiments toward their foremen. However, he also points out that initiations from foremen to workers were also exceedingly rare. The workers seem to be saying, in effect, "they don't bother us, and we don't bother them." In this situation, Argyris found expressions of liking—if not of respect—for the foremen. This suggests that while the ratio of initiations in the two directions is certainly of importance, we may be able to make further discriminations in sentiments as we examine the absolute frequencies of initiation.

This also suggests that a supervisor who has been initiating with a high frequency toward subordinates and allowing them little initiation in return can improve their sentiments toward him by decreasing his initiations for them and/or encouraging them to increase their initiations to him. The extent to which an individual can change his interactional behavior is another problem for study. Certainly we see changes of this nature much more frequently when one supervisor is substituted for another than when a given supervisor changes his interactional behavior. However, a recent study by Paul Lawrence (1958) provides us both with evidence of quantitative interactional changes for the same individuals over time, and with valuable methods for measuring these quantities.

What patterns of interaction fit with union-management cooperation? What with conflict? One of the obvious effects of the entry of a union into a plant is the rechanneling of interactions. Workers, being unable to initiate activity-changes up the regular line of authority, organize themselves into a union, which provides them with channels for initiating at the level of a foreman, superintendent, plant manager, and so on. If management people do not respond sufficiently to these initiations, the union brings about activity-changes at the work level, such as slowdowns and stoppages.

How does management respond to these union initiations? This is naturally a difficult adjustment to make. Some management people respond by taking up a defensive stance and trying to limit so far as possible the area of union initiation. When management responds in this way, we find sentiments of hostility and mutual distrust between management people and union officers.

Where the sentiments are different, we find a different pattern of interaction. More specifically, let us assume that we find expressions of mutual trust, liking, and respect between management people and union officers. They do not tell us that they have no disagreements. In fact, they tell us that they often disagree and argue their differing points of view most vigorously. However, they take pride in being able to arrive at mutually acceptable solutions to their problems. Where we find such a pattern of sentiments, we *always* find that management people are not only responding to union initiation, but are also initiating for their opposite numbers in the union structure. In other words, they are calling upon the union officers to help them work out problems in the organization of work activity in the plant.

It may seem presumptuous in this field to say that any *X* is always associated with *Y*. However, the ideas underlying these generalizations were first stated in systematic form a decade ago, and no exception has as yet come to my attention (*Human Organization,* 1949).

Patterns of Sentiments

We now come to the most slippery term in the present conceptual model. In fact, the concept is so slippery that some have advocated discarding it altogether—as we shall see.

First, we must recognize that people have sentiments about a wide variety of things. If we are going to say that the sentiments of an individual change, we must specify what sentiments, and this leads us to some sort of categorization.

The sentiments with which I have been dealing seem to fall into four categories. I make no claim that this is an exclusive scheme of classification. It simply covers sentiments that I have so far found most important in organizational life.

1. *Evaluation of behavior.* We constantly hear people saying that a certain action is good or bad, appropriate or inappropriate. We note this at the level of the individual. The individual's sentiments may be peculiar to him alone, but we often find members of a group expressing a high degree of consensus as to what is good or bad behavior, and rewarding individual members or punishing them according to their conformity to these collective judgments. When we observe this sort of consensus, supported by sanctions, we refer to *norms* of behavior, as do Homans and many others. (Note here a linking of sentiments and norms, which, Homans insists, must be kept separate.)
2. *Identification.* Here we are concerned with the way the individual identifies himself with other individuals, groups, or with the organization in which he works. How does he answer these questions: Who are my friends? Who are my enemies? To what group do I belong? And how much does that group mean to me? How do I feel about the organization itself?
3. *Ranking.* We might say that there are two dimensions to interpersonal relations. Under identification, we are covering such questions as, "Do I like or dislike Joe?" Under ranking, we are concerned with evaluations of relative prestige: "Does Joe have more or less prestige than Al?" People are expressing this type of judgment, explicitly or implicitly, all the time. Furthermore, we find that there is a high degree of agreement among judges in these evaluations (Warner, Meeker, and Eels, 1949). Apparently we are dealing with something that is both significant and tends to show a high degree of stability.

   Prestige evaluations are not limited to people. Workers are also concerned with prestige evaluations of the various jobs in the plant. Here again we find a high degree of consensus in rankings.
4. *Goals.* People also have ideas as to what they want to achieve. Research has shown that perceived progress or lack of progress

toward these goals has an important impact upon behavior. We are here dealing with what sociologists call the individual's "level of aspiration" and with the effects of success or failure in reaching this level.

Let us turn to the controversy regarding sentiments. The charge against sentiments consists of two points: (1) They cannot be directly observed; (2) If they have any standing at all, they are simply dependent variables, changing in response to interactional changes.

Regarding the observability point, there are two answers. In the first place, the charge is not completely true, because often we observe people behaving toward each other in ways which provide us with clear inferences of the sentiments they feel toward each other. Even when this is not so, we find innumerable instances in the other sciences where concepts have proven useful even though there are no direct means of observing and measuring the phenomena to which they point.

On the second point, let us consider the argument posed by Eliot Chapple in a *Human Organization* editorial comment (1955*a*) on the article by Arthur M. Turner, "Interaction and Sentiment in Foreman-Worker Relationship."

The editorial is entitled "Sentiment *vs.* Interaction: A Query" (*Human Organization,* 1955)—although the point of view expressed hardly represents a query. Chapple makes his point this way:

> In describing his two opposed variables, Dr. Turner brings sharply into focus the nature of the definitions that are used to make the dichotomy and provide him with the data for his analysis. He asks each worker to tell him how frequently he interacts with his foreman; he then asks how well the worker thinks the foreman gets along with his men. The first question defines interaction as the number of times interaction takes place; the second derives sentiment or attitude from the description by the worker of what he means by "getting along."
>
> But when we look at his cited examples of how the foreman "gets along," we find the workers describing how he behaves in the interaction that takes place. "You tell him something, he just walks away"; "an experienced foreman will listen to you"; "he's authority crazy; he wants you to bow down to him"; "this one blows up at everything." All of these are behavioral descriptions of the pattern of interaction within the contact, ordinarily amplified by statements of the attitude or sentiment or feeling accompanying them. From our view, then, what has been done is to correlate the frequency of events or contacts between worker and foreman with the patterns of interaction within the contact. Where there are deviations in the general uniformity—that the more frequent the interaction, the more favorable the sentiment—the author shows that they result from personalities who require little interaction,

> or who avoid being exposed to a pattern to which they find it difficult to adjust.
>
> . . . one can ask whether observation of the interaction of these workers and their foremen would not lead one to conclude that sentiment is the resultant of the interaction pattern, and has no useful existence as an explanatory concept.

Chapple assumes that a change in interactions necessarily involves a change in interpersonal sentiments. By his logic, however, changes in interpersonal sentiments do not precede and give rise to changes in interactions. I do not believe such a generalization stands the test of experience or research.

Consider the situation in which a number of people found themselves at the height of the McCarthy Communist hunt. Let us say that John Smith has a pattern involving several interactions a week with a number of his friends and neighbors in his community. Then one day newspaper headlines announce that he has been charged with being a Communist. All of a sudden, Smith finds that he is not interacting with the people that he was before. While I have not investigated such cases myself, there have been several newspaper reports which make it quite clear that the interactional changes followed publication of the Communist charge. The ordinary person would be inclined to conclude that the reading of the newspaper report changed the sentiments or attitudes of certain individuals toward Smith and that the interactional changes followed. In somewhat more technical terms, a change in the social and cultural environment produces symbols that change sentiments, and, the sentiment-changes produce interaction-changes.

Let us look at the concept in terms of a more familiar research problem: worker-response to financial incentives in industry. Research has certainly shown that worker-reactions to incentives are strongly influenced by the interaction pattern among workers, management people, and union officers (Whyte, 1955). However, their response can also be examined by giving attention first to sentiments. Workers seem to have certain well-defined sentiments regarding how much a particular job and a particular level of effort and skill should be worth. Furthermore, these sentiments do not arise entirely out of the interactions within the plant. Workers compare their lot with that of others doing similar work elsewhere, so that worker-sentiments regarding what is a "fair" income for their work can change, quite independently of what is going on within the plant.

Now, if the incentive payoff is markedly below what the sentiments indicate, then it is not always possible to get the workers to change their sentiments on the adequacy of rewards through changing the interaction pattern. Sometimes management has to make a change in the incentive rate to bring it in line with worker-sentiments, and only when this is done will the workers begin to modify their sentiments regarding the incentive system, management, and so on. In this context, then, sentiments do not seem to be mere passive accompaniments of interactions.

To explore further how changes may be introduced into the social system through sentiments, let us consider two cases in more detail. The first involves a sentiment-change that led to the establishment of new interactional relations: the recognition of a union. The second involves the impact of sentiment-changes within a given social system.

Mr. Buchsbaum Recognizes the Union

Herbert J. Buchsbaum, president of a small Chicago company manufacturing jewelry and plastics, recognized the union in 1941, after a five-day strike (Whiteford, Whyte, and Gardner, 1946). Up until this strike, Mr. Buchsbaum had been a bitter opponent of unions. When his employees went out on strike in 1935, he hired a labor spy to furnish him daily reports from the enemy camp and, by means of bringing in strike breakers, was able to eliminate the union.

He speaks this way about the period between the two strikes. (I have italicized in this and later quotations what seem to me the key symbols.)

> Nothing happened between 1935 and 1940 to change the way I felt about unions. I had a few friends who could see some good in unions, but I was arguing with them just as strongly in 1940 as I had in 1935. I thought they were crazy.
>
> My mother has always been on the side of the workers. She used to say, "The poor people. They work so hard, and what do they get to show for it?" In the middle of the 1935 strike, she came into my office and pleaded with me to settle and take the people back. I certainly didn't want to listen to her then, because I knew that I was breaking the strike. I said to her, "Mama, you've got the wrong idea. This whole thing was stirred up by a few *troublemakers*—just a *bunch of reds.* When we get rid of them, everything will be all right." That didn't satisfy her, but still she wasn't able to make me change—then or later.
>
> But while I stayed the same, the world around me changed. By the time of the strike in January 1941, the Wagner Act had been declared constitutional by the Supreme Court, and we were getting used to the idea. I didn't want to violate the law, and it wasn't just because of the penalty involved. *Capital must believe in law and order because*

if you don't have law and order what protection is there for your capital?

By 1941, the legal situation regarding unions and public opinion in these matters had changed so that Mr. Buchsbaum felt somewhat more limited in his freedom of action than he had in 1935. However, he went into the strike determined to break it. Furthermore, he faced no economic pressures forcing him toward a settlement. The strike came in early January, just after the Christmas rush, and in what was normally a slack season for the company. From Buchsbaum's standpoint, the strike could not have come at a better time. Why then did he settle so quickly?

Let us examine the answers provided us by some of the key participants in the case. First a statement by Sidney Garfield, union business agent:

> I think something that made him (Mr. Buchsbaum) trust me was rather interesting. During the strike, things were pretty rough for a while and we had a number of clashes when people tried to get into the plant. One time one of the men came flying down the street about sixty miles an hour in a car and ran right up on the sidewalk to the doors of the plant and tried to let people in that way. He might easily have run over some of our boys standing around, but they got between him and the door of the plant and had him trapped there. The strikers were all for taking care of him quickly right then and there and turning the car over in the street, but I knew enough to realize that that would be a bad move because of *the great American tradition of respect for property* so I made them leave the car alone. I don't mean that I was easy. There was one fellow who was trying to sneak in, and I pulled him out of his car and just kicked him down the street.
>
> When this incident came up, the chief company detective was standing right inside the door with a gun in his hand, but he was afraid to use it, and I found out later that he was impressed by what had happened and had gone up and told Herb Buchsbaum about my respect for property which apparently made some impression on Herb, too. It's the little things which make the difference.

Let us see how this situation looked to Mr. Buchsbaum.

> While I made my plans to break the strike, I couldn't help noticing that it was different from our 1935 struggle. There were nearly all *our own people* on the picket line. I thought I knew him pretty well, even though they had turned against me. It was zero weather, and it was pretty cold out on that picket line. I stopped and talked to the boys, and I told them to come in the vestibule and picket. That's the kind of strike it was.
>
> There was quite a bit of *violence and sabotage in our 1935 strike.* Expensive equipment was smashed, sand was thrown in bearings, ma-

> terials were destroyed, and there were some bricks thrown through the windows.
>
> The 1941 strike was quite different. A few people got beaten up, but *the company suffered no property damage.* The union had good discipline on that point. There was one time when some of our people were trying to get through the picket line into the plant. They drove up in a car onto the sidewalk and right in front of the plant entrance to get the people in. That car endangered the lives of some of the picketers, and they rushed up and wanted to turn it over. Garfield stepped in then and wouldn't let them do anything to the car. That made an impression on me when I was told about it. I felt that these were *responsible people.* I didn't agree with them, but I could see that they were going out of their way not to harm the company.

Mr. Buchsbaum now continues with the story of the events leading up to union recognition:

> As soon as the strike started, Sam Laderman (Union general manager), asked me to meet with him and a committee of the strikers. I didn't want to do it, and I called my lawyer three times to try to find some way out of it. Each time he told me I had to accept the invitation because it would have been a *violation of the law* not to meet with them.
>
> On the second day of the strike I had lunch with Laderman and with a business acquaintance of mine who had a contract with his union. Up to that time I thought *all union people were a bunch of racketeers.* My friend reassured me on this point. He said that you could count on Sam Laderman *keeping his word.* He told me that Sam was a real human being. He *liked opera.* He *disliked fights.* There would be nothing he would like better than being friends with the employer if it were possible. He assured me that the union was always willing to discuss things from a reasonable point of view. And Laderman assured me that our contract would contain the standard clause that it would be no less advantageous to the employer than contracts the same union made with any other firm.
>
> That made an impression on me. I still had no idea of settling the strike but I agreed to meet with Laderman and a committee of the employees on the third day.
>
> Well, we sat around the table and began talking. I knew all the men there. We were just a small firm at the time.
>
> The first question one of the men asked me was this: "Mr. Buchsbaum, why are you against unions?" Now that was a good question and I welcomed it. I thought that gave me a chance to win them over to my line of reasoning. I stated: "I'm against unions because they *limit production.* They put production down to the level of the slowest employee and at the same time force impossible wage increases, driving the company out of business."
>
> They started talking all at once. *They didn't want to limit production, but increase it.* They wanted to see the company go ahead.
>
> I asked: "How can you increase production?"

> I got answers fast. Each one had a sound suggestion for his department. First spoke one of the polishers. He told of the large door behind the polishing department used for in and out shipments—how in zero weather this door was opened many times daily, obliging the perspiring men to leave their wheels and go to the washroom to save themselves from catching cold. How a simple protecting partition would save about an hour and a half per man per day. Other suggestions equally good came from everyone in the circle. I took notes that I could see would save the company thousands of dollars annually.
>
> In that first meeting they really sold me a bill of goods. There was one thing that convinced me. When the workers began talking I saw that they had my interests at heart—as well as their own. I realized I had done them a great injustice in thinking that they had turned traitor to the company.

At this point Herbert Buchsbaum announced his decision to recognize the union and furthermore stated that he was prepared to do everything possible to establish a cooperative relationship.

I shall return to an analysis of this case after I take up the "Watchman Case," to be described below.

The Watchman Case

In the spring of 1943, the Oil Workers International Union (CIO) was undertaking to organize the workers in the Hi-Test plant and related plants of Blank Oil Company in "Oil City." After making some initial gains, the organization drive seemed to have stalled.

The workers had a number of grievances, which are discussed in detail elsewhere (*Human Organization*, 1956), but about a year before the event to be described, management had made some strategic changes in personnel in the local area. The new works' manager, superintendent, and foreman were all proving to be quite popular with the workers. Many of the workers continued to distrust the main office, but the smoothing-out of relations locally caused some workers to wonder whether they could not solve their problems with these new and reasonable men, without recourse to the union.

At this time, representatives of the company union were carrying on some discussions with main office management. Few if any of the workers had faith in the company union. They looked upon the company union as a helpless organization, that could only give them whatever management was prepared to give in the first place. In fact, the existing contract between the company union and management was a most unusual document, in that it contained no references to wages. These were determined solely by the company--although management people expressed a willingness to listen to company-union representatives on the question of pay rates.

Management's willingness to listen to the company union seemed to be greatly increased at this time when the CIO organizing drive was going on. So the company-union representatives met with higher-management negotiators to discuss a number of problems, including wages.

While the workers themselves had little hope of gaining any advantage from these discussions, they naturally followed them with interest. A symbolic bombshell exploded when the company-union representatives were seeking to make a case that the number one operators in the Hi-Test plant should receive a pay increase. They sought to back up this claim by emphasizing the high degree of skill of these men and the great responsibility they carried. The management people were not agreeing to any increase, but the formal discussion ended without any bitterness. After the meeting, the chief company negotiator expressed his views informally—and graphically. The Hi-Test company-union representative reported the incident in this way to his fellow workers:

> Did you hear what Masters said about us? He told us that we were only watchmen. He said, "Down there in that plant you have got automatic controls and charts. If anything goes wrong with the meters, you just call a meter man. If anything goes wrong with the engines, you call a repairman. If anything goes wrong with operations, you call an engineer, and he tells you what to do. There is no skill in that work. You just have to watch the charts."

This statement had a sudden and dramatic effect on the social system. For the workers who had been trying to organize for the CIO, an uphill struggle had suddenly become downhill. One man reported that in the week following the watchman statement, he had signed fifty workers to union pledge cards. He added that many of these were men who previously would not even listen to his union argument. A number of men put the case to me in these or similar words: "I used to think the company had respect for its men. If this is what they really feel about us, then we sure need the protection of a union."

The statement also had an impact upon human relations in the local area. The plant engineer had always gotten along with the Hi-Test workers reasonably well, but now, for a period of several days, he found them complaining against him on matters that had previously been passed over without a comment.

On the day after the watchman statement, the chief engineer for the division dropped in on the Hi-Test plant and noted that the number four fractionating column was giving the workers some difficulty. He asked what the trouble was. The number one operator on the shift replied: "You're the engineer. You're supposed to tell us." The chief engineer had had no previous difficulties in communicating with these men.

The Role of Symbols

So far, I have been undertaking to demonstrate how changes in sentiments can effect changes in interactions and activities. Now let us examine further the process whereby sentiments change. At this point, I shall have to deal explicitly with the concept of "symbols" which has been implicit in the discussion all along.

In earlier writings, I have recognized the importance of symbols, but I have not been clear as to their relations to the other parts of the social system. For example, in *Pattern for Industrial Peace* (Whyte, 1951), I announced that my "theory" was based upon four terms: interaction, symbols, activities, and sentiments. I did not state what relationship symbols bore to the other three concepts because I was not clear on this point at the time. Now I would put it this way: symbols are the link between the individual's sentiments and his social and physical world.

Before we go farther, a definition: symbols are words, physical objects, or acts that *stand for* relations between man and man, and between man and his physical environment.

The individual, in the course of his experience, endows words, objects, and acts with symbolic significance. The symbols furthermore take on a positive or negative value for the individual, according to the character of the experiences he has had in previous association with a given symbol. The sentiment in question arises out of a response to a given symbol in this positive or negative aspect.

Generally speaking, we find a fairly stable pattern of sentiments and also of symbols. The symbols presented to us fit so well with our existing sentiments that we are not aware of the impact of the symbols. They simply reinforce our view of the world.

It is only when the symbols depart sharply from the sentiment-pattern that we are able to see the impact of symbols on sentiments, and, through sentiments, on interactions and activities. It is for that reason that I discuss at length these two cases of striking sentiment-changes.

To deal with them more systematically, let us introduce at this point Osgood's Semantic Differential (Osgood, Suci, and Tannenbaum, 1957), adapted for present purposes. The problem is to determine the sentiments that are important to the individual in the social context we are studying. We can then get him to evaluate other people along the dimensions of his sentiment pattern. We can do this by arranging the positive and negative aspects of each sentiment on opposite sides of a piece of paper with seven short lines in between, giving the individual an opportunity to locate any other individual at any of seven points along this dimension (see accompanying chart).

For example, in the Buchsbaum Case, it is evident that respect for private property is an important value. The opposite of this would be no respect for private property. As in the chart, we can pick out five other dimensions of Buchsbaum's sentiments, inferred from his own account of his clash with the union. These are shown in the accompanying chart.

Dimensions of Sentiments of Herbert J. Buchsbaum

Bad								Good
no respect for private property	—	—	—	—	—	—	—	respect for private property
racketeers	—	—	—	—	—	—	—	dependable, honest people
combative	—	—	—	—	—	—	—	peace loving
crude	—	—	—	—	—	—	—	cultured
limiting production	—	—	—	—	—	—	—	production minded
outside agitators	—	—	—	—	—	—	—	our own people
illegal	—	—	—	—	—	—	—	legal

Let us assume that we had been able to make a study of Buchsbaum's sentiments before the crisis arose and had established these seven dimensions for him. We might then have asked him to check where he would place a union leader on each dimension. We can assume that he would have placed the union leader at the extreme negative end of each dimension, with two possible exceptions. Perhaps he might have recognized at least a slight distinction between union leaders and men whose only occupation is in the rackets. And the Supreme Court's decision, even then, would have made it difficult for him to place a union leader as "illegal."

Now suppose we had given him the same instrument and asked him to score it for a particular union leader, Garfield or Laderman, immediately following the strike settlement. If we follow his own account, we can assume that he would have made his check marks in this instance much farther over to the good end of the dimension. Since this is a hypothetical example, we cannot demonstrate where exactly he would have placed the particular union leader on these dimensions, but the exact location is not important. I am simply trying to demonstrate a method, whereby the connection between symbols and sentiment can be shown.

Here, Garfield's dramatic intervention in preventing the men from turning over the automobile seemed to demonstrate a high degree of respect for private property. Changes in the next three dimensions do seem indeed to be related to interactions—in this case interaction with a trusted business friend who spoke of the dependability, and of the peace-loving and cultured aspects of Sam Laderman. Incidentally, in this connection, it is interesting to note that Mr. Buchsbaum himself had no liking for opera. However, he did recognize opera as a symbol of advanced culture. Hearing that the union leader was a devotee of opera seemed to establish him for Buchsbaum as a cultured individual. The shift from limiting production to production-mindedness seemed to occur particularly in the meeting Buchsbaum held with his own workers, but which included also the union leaders. Finally, we see that it is important for Buchsbaum to look upon workers as "our own people" and, as the union leaders undertake to reassure him on this point, he can accept even them as part of the new social system in which he is going to interact.

It is important to note that while important shifts in sentiments took place, they all took place along an established dimension. If the union leaders or Mr. Buchsbaum's business friend had appealed to him for the union in behalf of social justice, the rights of man, or some other concepts that had no place in Buchsbaum's pattern of sentiments, we can assume that no change would have taken place in this respect. It was only after some period of experience in dealing with the union that new sentiments such as these gained a place in Mr. Buchsbaum's sentiment pattern.

I shall not undertake to analyze the Watchman Case in such detail. However, here there is obviously at least one important dimension involved. We might establish the dimension as "respect for the men" and "no respect for the men." A number of the men told me they had assumed that higher management had some respect for the men, and that the watchman statement convinced them that management had no such respect.

Following this scheme, we can assume that as individuals and the organizations they represent shift in the subject's sentiment-dimensions toward the favorable end, he will show an increased willingness to interact with these individuals, and he will evince a greater sentiment of loyalty to the other individuals in the organizations they represent. On the other hand, as the symbolic shift takes place toward the negative direction, we can expect individuals to withdraw from interaction in the sphere represented and to increase their interactions with individuals and organizations considered to be in conflict with those symbolized.

Shifts seem to occur when the individual is presented with symbols which fit into an established dimension of sentiments but in a markedly different position on this dimension. No doubt there are many times when the individual is able to overlook or rationalize away these symbolic discrepancies, while there are critical occasions (such as the two cases just analyzed) where the symbol changes have dramatic impact upon sentiments. We need to know much more than we now do regarding the conditions under which symbol changes will or will not affect sentiment changes.

Interaction and the Leadership Problem

Before concluding this theoretical statement, it is important to point to some of the confusions that are to be found in the literature regarding one of its key concepts: interaction. I feel particularly obligated to do this, because I have contributed my share to the confusion.

Since interaction is a concept around which some of us have erected our theoretical scheme, you have a right to expect that at least this concept would be clearly defined and consistently used. Such is not the case.

First we need to make a distinction between what we might call micro-interaction and macro-interaction: micro-, dealing with fine measures of interpersonal adjustment within a given contact, and macro-, dealing with broader interpersonal patterns and influences.

Working with the interaction chronograph,[5] which he invented and developed, Eliot Chapple is dealing with micro-interaction. The chronograph is a machine designed to measure the interaction between two individuals: the length of time each talks or gestures, who continues talking following interruption, who starts acting again following a pause and so on.

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[5] See E. D. Chapple, "The Standard Experimental (Stress) Interview as Used in Interaction Chronograph Investigations," *Human Organization,* 12, No. 2 (1953). Also E. D. and Martha F. Chapple, and Judith Rapp, "Behavioral Definitions of Personality and Temperament Characteristics," *Human Organization,* 13, No. 4 (1953). For a useful summary, see Joseph D. Matarazzo,

The interaction chronograph and the methodology that goes with it may prove to be the most important social science invention of a generation, but nevertheless I shall not discuss it further here. The chronograph has been used primarily to study personalities in relation to organizational position and performance. In this paper, I am concerned with other problems.

If we pass over the micro-analysis of interpersonal adjustment within a given contact, we find that certain aspects of macro-interaction are easy to specify and observe, whereas others present very complex problems. We can observe who makes the contact, what individuals are involved in the interaction, and how long a time they spend together. We can measure the frequency and duration of interaction between Jones and Smith. We can also determine what proportion of the time Jones made the contact as against the proportion of the time in which Smith makes the contact.

To complicate our problem, let us consider two hypothetical cases:

1. Smith comes up to Jones and says, "Go get me a cup of coffee." Jones replies, "Sure, right away." Jones then walks away and returns in five minutes to give a cup of coffee to Smith.
2. Smith comes up to Jones and says, "Go get me a cup of coffee." Jones replies, "Go jump in the lake." Jones then walks away. He returns five minutes later to speak to Smith—but without the coffee.

The two cases are identical, in so far as we are simply concerned with the origination of interaction. In both cases, Smith originated interaction for Jones and then, five minutes later, Jones originated interaction for Smith. However, if we are concerned with questions

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George Saslow, and Ruth G. Matarazzo, "The Interaction Chronograph as an Instrument for Objective Measurement of Interaction Patterns During Interviews," *The Journal of Psychology*, **41**, 347–367 (1956). See also George Saslow, Joseph D. Matarazzo, and Samuel B. Guze, "The Stability of Interaction Chronograph Patterns in Psychiatric Interviews," and "Stability of Interaction Patterns During Interviews: A Replication," *Journal of Consulting Psychology*, **19**, No. 6 (1955), and **20**, No. 4 (1956).

of personal influence or leadership, there is obviously a marked difference between them.

It is this concern of some of us for studies of leadership that have led us beyond the simple counting of originations of interaction and frequencies and duration of interaction. I am not saying that such observations and measurements are not significant. I am saying simply that they do not tell us some of the important things we want to know.

In my own work, I have spoken of origination of action (or activity) in the sense of Smith getting Jones to do something Smith wishes done. See, for example, my article, "Patterns of Interaction in Union-Management Relations" (*Human Organizations*, 1949). However, this article was not based upon observational data. In interviews, people seem to have little difficulty in reporting not only who made the contact, how often they got together, but whether or not Smith got Jones to act. I have found this sort of approach useful in providing a general framework for the understanding of union-management relations, and yet it conceals a methodological problem which becomes apparent as we try to observe the origination of action or activity.

It is relatively easy to observe whether Smith or Jones makes the contact in their meeting. It is not so easy to observe whether Smith gets Jones to do what Smith wants him to do, and, in fact, we cannot get at this on a strictly observational basis. Some inferences must be made.

Some years ago, Chris Argyris and I spent several months in developing and trying out a system of coding observed interactions, in the hope that we could not only get who contacted whom but also who got action out of whom. Applying our scheme to a factory department, we bogged down in the face of certain methodological and coding problems and abandoned our efforts.

We seemed to face two major difficulties. If Smith asks Jones to act, Jones may respond in ways that cannot be classified simply as positive or negative. He may agree to act and then not act—but this could only be determined by some follow-up interviewing or observation. He may agree to act and indeed act but at a time much later than what Smith had in mind. He may indeed act in response to Smith's initiative and yet do something quite different from what Smith proposed. Finally, Jones may do part of what Smith indicated but leave another part undone. All of these cases may look the same to the observer at the moment, and yet they would seem to have quite different consequences, if we were able to follow up on each origination.

We were also not clear as to how we should handle the very frequent situation where Smith asks Jones a question and Jones gives him the answer, and only a simple provision of information seems to be involved.

As I review our records, I am not inclined to believe that we bogged down because we were facing an insoluble problem. I think now that our major difficulty was that our effort was purely a methodological one. In many of the instances where we had disagreement among coders, it now seems quite possible to establish a convention dictating how the type of incident should be scored. However, how the scoring should be done will depend in part upon what kinds of research questions we are trying to answer. If we do not know what we are trying to find out, we have no standards for determining whether, when Smith asks Jones a question and Jones answers, (*a*) Smith has originated for Jones, (*b*) Jones has originated for Smith, or (*c*) neither has originated.

Probably we can solve the methodological problems if we are seeking the answer to some significant theoretical question. At least, those of us who want to continue to talk about origination of activity would seem to be under an obligation to develop a defensible methodology for handling the concept on an observational basis.

In a study of work groups in the Steuben Division of Corning Glass Works, Frank Miller (1958) ran into another problem which has involved a disagreement in observation and coding among interactionists. This was an observational study in a situation where six to eight men worked together as a team, and there was a high frequency of interactions among them. However, Miller early noted that there seemed to be one class of interactions that could not readily be coded in terms of origination by Jones or by Smith. There were no methodological problems involved when Miller could see an action by Jones following words spoken or gestures given by Smith. However, there were recurring interactions among the men in which it was impossible to say that either Smith or Jones originated for the other—because no word was spoken nor was any gesture made. The men came together and performed certain actions together because they were at the point in the production of the glass object where the process required such interaction. In other words, they were responding to the point that had been reached in the work-flow.

This type of observational problem might exist in many work groups. It has been noted in studies of hospital operating rooms. One whose knowledge of the operating room is limited to what he sees in the movies may have the impression that every move made by the nurse is in response to a command or gesture from a surgeon. In any smoothly functioning operating room, this is hardly the case. The skillful nurse knows, on the basis of training and experience, what stages the operation will go through and what actions and tools are required by the surgeon at each stage. Through her observation of the surgeon and more particularly of the patient, she often provides the surgeon with the tool he will need next without his making any overt sign to her.

Miller decided to call these interactions "situational" and coded them separately from interactions in which Smith originated for Jones through word or gesture.

It is not my aim to resolve here the methodological problems that arise in field studies of interaction. I include this section to indicate that theories based on the interaction concept are quite firm at some points and on somewhat shaky ground at others.

Conclusions

Having just pointed to some of the weaknesses involved in the theory presented here, let me conclude with pointing to some of the strengths.

In much of the work done on organizations today, and particularly in studies using the questionnaire as the major research instrument, the focus of attention has been on attitudes (or sentiments, to use my terminology). There have been important technical advances in methods of measuring sentiments with a questionnaire, and this work can be used in the present conceptual scheme as well as in others. However, if we can demonstrate that sentiments are changed by changes in interactions and activities and that all three are subject to influence from forces in the environment, then it follows that any methodology or any theory which focuses exclusive or primary attention upon sentiments is seriously deficient.

I am not implying that those who use the questionnaire as their primary research instrument are not interested in anything except sentiments. They are concerned not only with how the worker feels about his foreman but with what happens in the foreman-worker relationship. However, the questionnaire can only tell us how the worker and the foreman *perceive* the relationship. The perceptions of people are important to know, but it is certainly at least equally important to know what is actually going on. For getting at what is going on, the questionnaire is an exceedingly blunt instrument. At

Cornell, we once tried to use it in this way in a study of a local union. As Lois Dean has reported (1958), we used a questionnaire containing some questions about attendance at union meetings, and we also had an observer, George Strauss, to report to us which employees were actually present in union meetings during the year. Comparison of data from the two methods indicated that twenty-nine percent of those who reported attendance at union meetings had actually not been present.

The theory presented here is, of course, crude, and yet I hope that it opens the way for advances in the understanding and control of organizations. At the present time, it is little more than the presentation of a pattern of leading ideas. However, in a large measure the behavior underlying each of these ideas is subject to observation and measurement. As we proceed with such observation and measurement, we should be able to develop a much tighter and more systematic scheme in which we show in much more detail the relations among the various concepts. We may even hope to reach the point where we can show what quantities of interactional changes will be associated with what type of sentiment changes and so on. At the present time, we can do this as we deal with extreme cases. The hope is that improvements in methodology and theory will enable us to make finer discriminations.

The theoretical scheme presented here also has some important implication for human relations training. Much of the human relations training carried on today seems to be based on the assumption that there is *the* foreman and *the* executive and that therefore we should develop a foreman-training program and an undifferentiated executive-development program.

If we take seriously the statements presented here regarding the impact of the environment upon the social system and also the impact of different types of activities upon interactions and sentiments, then we must recognize that there is no such thing as the good foreman and the good executive.

I am not saying that each foreman's job and each executive's job is unique. This is true only in the sense that we cannot find two jobs that are exactly identical in all respects. However, of course we can find important similarities between jobs. We need to look for these similarities and undertake, then, to train people in terms of the common problems they face.

This means that we are not going to get very far with foreman training or executive development in human relations until we observe and analyze the activity and interactions involved in the jobs in question and build training programs to fit jobs and not to fit such empty and relatively meaningless titles as foreman and executive.

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RENSIS LIKERT

7.

A Motivational Approach to a Modified Theory of Organization and Management

THERE IS SUBSTANTIAL AND GROWING EVIDENCE THAT THERE ARE important inadequacies in the organizational and management theories upon which most American business organizations and governmental agencies base their operating procedures. These inadequacies are clearly evident when the procedures used by the highest-producing managers and supervisors are compared with the procedures called for by the standard practices of the organization. The low-producing managers and supervisors are following the practices called for by the organizational theory used implicitly or explicitly by their company. But the high-producing managers and supervisors are deviating in important and systematic ways from these procedures and from the underlying theory upon which they are based. (See attached list of references.)

It is becoming increasingly clear, consequently, that a modified theory of organization and management is needed. An attempt will be made in this chapter to describe the over-all characteristics of such a modified theory of management. This theory is based on substantial research findings which show the character of the better practices and principles developed and used by the managers and supervisors who are achieving the highest performance in American business. These findings have been summarized elsewhere (Kahn and Katz, 1953; Kahn, Mann, and Seashore, 1956; Kahn, 1958; Katz and Kahn, 1952; Katz and Kahn, 1952*a*; Likert, 1952, 1955, 1956).

The modified theory builds upon all that works best in existing theories. It uses fully all the tools but not the philosophy of scientific management, cost accounting, and similar technologies and developments. These include:

A. Elimination of waste and inefficiency through functionalization, work simplification, and related processes;
B. Establishment of specific work goals;
C. Measurement of work accomplished and the continual examination of the extent to which the specified goals are being achieved;
D. Budgeting, cost accounting, and controls over costs.

Under the modified theory, however, these resources are used in a different manner, based on a different set of motivational assumptions, and with a different logic or philosophy from those upon which the traditional theories are based.

The traditional theory largely ignores the importance of motivation. The modified theory emphasizes the necessity of a high level of motivation throughout the organization if the goals of the organization are to be achieved. To obtain a high level of motivation, those motivational forces which are most powerful and most likely to be reinforcing and cumulative should be used. Procedures which produce conflicting motivational forces and thereby reduce the level of effective motivation are to be avoided. The theory specifies, consequently, that the operating procedures for performing all such functions as supervision, communication, training, compensation, decision-making, etc., should be of such a nature that the motivational forces used are likely to be additive and reinforcing.

The major motivational forces which can be used in a reinforcing manner include such motives as those that spring from:

A. The economic motives;
B. The ego motives (including the desire for growth and significant achievement in terms of one's own values and goals, as well as

the desire for status, recognition, approval, acceptance, and so on);

C. The security motives;
D. Curiosity, creativity, and the desire for new experiences.

In addition to using the most powerful resources of existing theories, and, insofar as possible, having all members of the organization highly motivated to achieve the organization's objectives, there is a third requirement. No matter how highly motivated are its members nor how good its procedures, an organization will not be effective unless the efforts of its members are coordinated and focused. The third concept of the modified theory is that there needs to be an efficient interaction or mutual influence system which provides the mechanism through which the activities of the organization are integrated and coordinated. The character of this interaction mechanism has to be such that there is:

A. Full and efficient communication of all relevant information between the various levels of the organization and across them: up, down, and sideways;
B. Opportunity for members of the organization to exert appropriate and adequate influence on others in ways related to their experience, knowledge, and information;
C. Decision-making processes which use fully and intelligently all the information available in the organization and which are designed in such a way that the members of the organization are highly motivated to carry out these decisions.

The fourth major concept of the modified theory relates to the use of measurements. Not only should production, costs, waste, and earnings be measured regularly, but also those human dimensions which affect the organization's capacity to produce: the motivations of its members and the effectiveness with which such processes as communication and decision-making are carried out. Accurate measurements of these human organizational variables need to be obtained regularly in order to build and maintain an organization capable of functioning at all times in a manner geared to achieve its objectives (Likert, 1958).

These four concepts or dimensions of the modified theory are suggested by the research dealing with the pattern of supervisory behavior displayed by the high-producing managers and supervisors in contrast to those who achieve mediocre results.

How does an organization develop operating procedures which fit the central concept of the modified theory, namely, the achievement of a high level of motivation throughout the organization? What general formula can be proposed? The research findings indicate the answer. For example, a study was made in a large public utility to discover the leadership practices which result in favorable attitudes toward all aspects of the working situation. About eight hundred employees in work groups with the most favorable attitudes in the company, and eight hundred in work groups with the least favorable attitudes were asked, "In what way does he [their supervisor] supervise you and the people in your work group?" As the results in Figure 1 show, there was no difference between the work groups with favorable and unfavorable attitudes when it came to such aspects of supervision as "arranges work," "makes work assignments," and "supplies men with materials and tools." Apparently, matters of this kind, which are very important in terms of performing an operation, make no difference in terms of contributing to more favorable attitudes. But when a supervisor "recommends promotions, transfers, pay increases," "informs men on what is happening in the company," "keeps men posted on how well they are doing," and "hears complaints and grievances," the effect on attitudes and motivation is substantial. Similarly, markedly favorable impacts upon attitudes occur when the supervisor "will go to bat or stand up for his men," "takes an interest in his men and understands their problems," "usually pulls for the men or both the men and the company, rather than for himself or the company only," "is really part of the group, interests are the same as those of the people in the group," "men feel free to discuss important things about job with supervisor," "supervisor likes to get men's ideas and tries to do something about them." (See Figure 2.)

Basically, the supervisor of the work group with favorable attitudes "thinks of employees as human beings rather than just as persons to get the work done." Consistently, in study after study, the data show that treating people as "human beings" rather than as "cogs in a machine" is a variable highly related to the attitudes and motivation of the subordinate at every level in the organization. The extent to which the superior conveys to the subordinate a feeling of confidence in him and an interest in his on-the-job and off-the-job problems, exercises a major influence upon the attitudes and performance goals of the subordinate.

The kind of direct treatment of subordinates by supervisors which tends to result in the highest productivity shows a consistent pattern. As evidenced in a large number of studies, summarized elsewhere, it shows the following general characteristics:

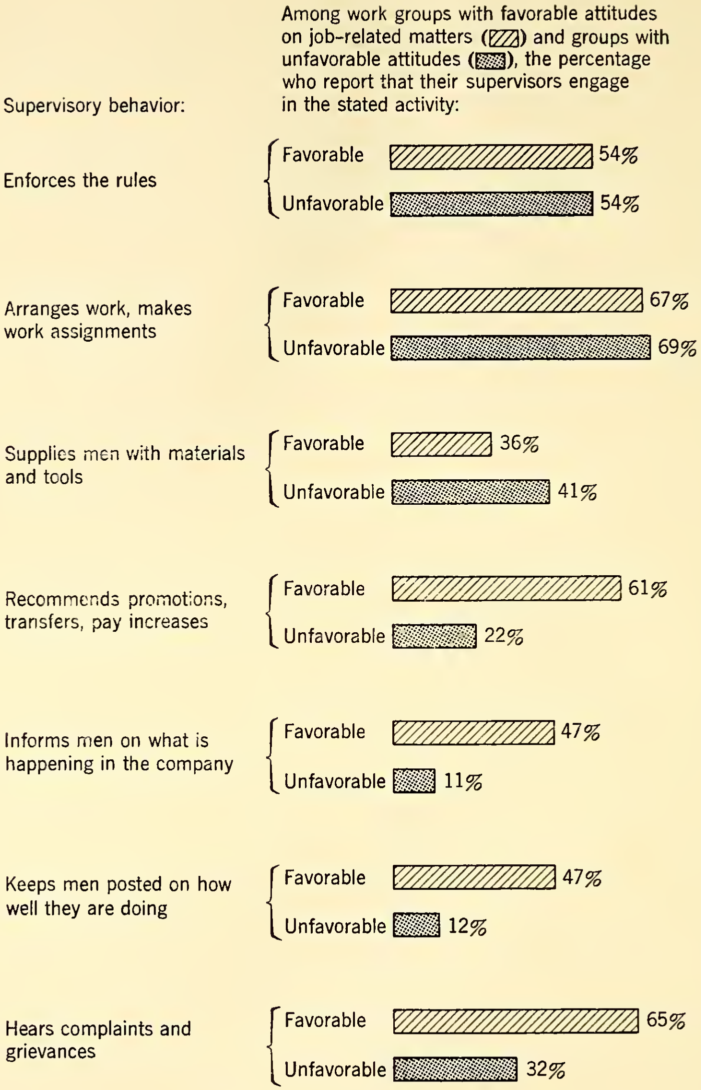

Figure 1. Relationship between supervisory behavior and the attitudes of workers on job-related matters.

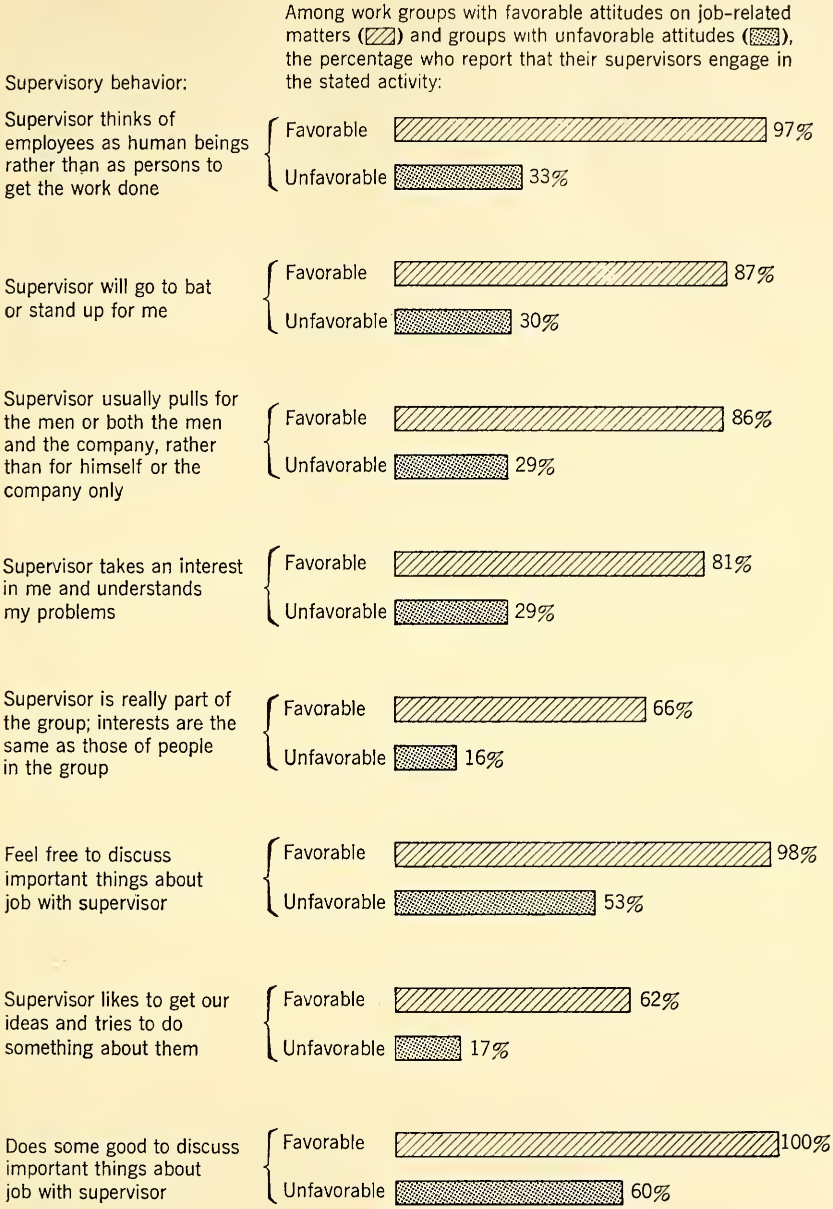

Figure 2. Comparison of supervisory characteristics of supervisors in charge of work groups with favorable in contrast to unfavorable job-related attitudes.

A. Attitude and behavior of superior toward subordinate as a person, as perceived by the subordinate:
   1. He is supportive, friendly, and helpful rather than hostile. He is kind but firm, never threatening, genuinely interested in the well-being of subordinates, and endeavors to treat people in a sensitive, considerate way. He generally is at least just, if not generous.
   2. He has confidence in the integrity, ability, and motivations of subordinates rather than being suspicious and distrustful.
   3. His confidence in subordinates leads him to have high expectations as to the level of performance by subordinates. With confidence that he will not be disappointed, he expects much, not little, from subordinates. This again is fundamentally a supportive rather than a critical or hostile relationship.

B. Behavior of superior in organizing and directing work:
   1. He engages in such activity as planning and organizing the work to be done, training subordinates, supplying them with material and tools, initiating work activity, etc.
   2. He has adequate technical competence, particularly in those situations where the work has not been highly standardized.

C. Behavior of superior in developing subordinates into a good working team:
   1. He creates a good working team which has a friendly, cooperative atmosphere with high group-loyalty. He seems to build this high group-loyalty through using participation and other recognized methods of group leadership. Moreover, the work group under his leadership accepts as group goals those objectives which must be achieved if the group is to do its part of the total task effectively and at a high performance level. The work group sets specific goals and checks its progress toward these goals regularly.

The Fundamental Concept and Its Implications

These results and similar data from other studies (Argyris, 1957; March and Simon, 1958) show that subordinates react favorably to experiences which they feel are supportive and contribute to their sense of importance and personal worth. Similarly, persons react unfavorably to experiences which are threatening and which decrease or minimize their sense of personal worth. These findings are supported also by substantial research on personality development (Argyris, 1957; Rogers, 1951) and group behavior (Cartwright and Zander, 1953). Each of us as an individual, as a human being, wants appreciation, recognition, a feeling of accomplishment, and a feeling that people who are important to us believe in us and respect us.

This general pattern of reaction appears to be universal and provides the general formula being sought: to derive operating procedures likely to yield high and cumulative motivation and an effective interaction system. Motivational forces acting in each member of an organization are most likely to be cumulative and reinforcing, when the interactions between each individual and the others in the organization are of such a character that these interactions convey to the individual a feeling of support and recognition of his importance and worth as a person. We should, therefore, seek to have the interactions between the people in an organization of such a character that they give the individual a feeling of confidence in his potentialities and a realization that his abilities are being well used.

A second factor, however, is also very important: an individual's reaction to any situation is always a function, not of the absolute character of the interaction, but of his perception of it. It is how he sees things that counts, not objective reality. Consequently, an individual will always interpret an interaction between himself and the organization in terms of his background and culture, his experience and expectations. The pattern of supervision and the language used that might be effective with a railroad's maintenance-of-way crew, for example, would not be suitable in an office full of young women! A subordinate tends also to expect his superior to behave in ways consistent with the personality of the superior. All of this means that each of us, as a subordinate or as peers and superiors, reacts in terms of his own particular background, experience, and expectations. In order, therefore, for an interaction to be viewed as supportive, it is essential that the interaction be of such a character that the individual *in the light of his experience and expectations* sees it as supportive. This provides the basis for stating the general formula that is needed to derive operating procedures for applying the modified theory in any particular situation, namely: *the organizational structure and its manner of functioning must insure a maximum probability that in all interactions each of the individuals involved will, in the light of his background, experience, and expectations, view the interaction as supportive and one which contributes to his sense of personal worth.*

This general formula provides not only the basis for deriving standard operating procedures; it serves another important purpose as well. It provides the basis for tapping fully, and in a reinforcing manner, economic and other powerful motivational forces in addition to the ego motives. There is impressive evidence that economic motivations will be tapped more effectively when the conditions specified by the general formula are met rather than violated (Katz and Kahn, 1952*b*; Krulee, 1955). The level of economic rewards is highly important, but so is the decision process by means of which these levels are established.

The central role of the work group

An important theoretical derivation can be made from the general formula. This derivation is based directly on the desire for a sense of personal worth which is a central concept of the formula. Each of us seeks to satisfy his desire for a sense of personal worth, which is a central concept of the formula. Each of us seeks to satisfy his desire for a sense of personal worth and importance primarily by the response we get from the people we are close to, in whom we are interested, and whose approval and support we are eager to have. The face-to-face groups with whom we spend the bulk of our time are, consequently, the most important to us. Our work group is one of the most important of our face-to-face groups. It is one in which we spend much of our time and one from which we are particularly eager to derive a sense of personal worth. As a consequence, most persons are highly motivated to behave in ways consistent with the goals and values of their work group in order to obtain recognition, support, and favorable reactions from this group. It can be concluded, therefore, that *management will make full use of the potential capacities of its human resources only when each person in an organization is a member of one or more well-knit, effectively functioning work groups that have high skills of interaction and high performance goals.*

The full significance of this derivation becomes more evident when we examine the research findings that show how groups function when they are well-knit and have high interaction skills. Research shows, for example, that the greater the attraction and loyalty to the group, the more the individual is motivated: (*a*) to accept the goals and decisions of the group; (*b*) to seek to influence the goals and decisions of the group so that they are consistent with his own experience and his own goals; (*c*) to communicate fully to the members of the group; (*d*) to welcome communication and influence from the other members; (*e*) to behave so as to help implement the goals and decisions that are seen as most important to the group; and (*g*) to behave in ways calculated to receive support and favorable recognition from members of the group, especially those who the individual

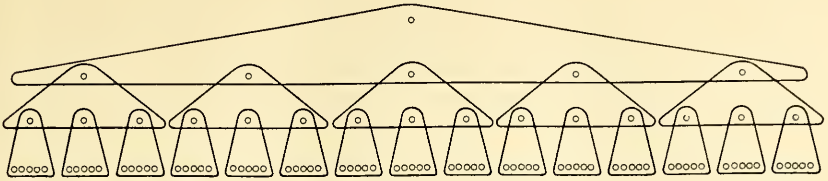

Figure 3

feels are the more powerful and higher-status members (Cartwright and Zander, 1953). Groups which display a high level of member attraction to the group and high levels of the above characteristics will be referred to in this paper as effective (high mutual influence) groups.

As our theoretical derivation has indicated, an organization will function best when it is made up of groups of people—loyal, effective work groups with high-performance goals. Consequently, management should deliberately endeavor to build these effective teams, linking them into an over-all organization by means of people who hold overlapping group memberships (Figure 3). The superior in the bottom group is a subordinate in the next group and so on up through the organization. If the work groups at each hierarchical level are well-knit and effective, the linking process will be accomplished well. Staff as well as line should be characterized by this team pattern of functioning.

In most organizations it will also be desirable to have various committees, staff activities, etc., which involve effective groups and which help further to tie many parts of the organization together. These links are in addition to the linking provided by the overlapping members in the line organization and strengthen further the interaction-influence system. Throughout the organization the supervisory processes should develop and strengthen team spirit and group functioning. This theoretically ideal organizational structure, when properly used, provides the interaction-influence system called for by the modified theory. It will result in an organization characterized by high capacity for efficient, full communication in all directions, high loyalty and trust, and high motivation to achieve its goals.

The traditional company organization

Let me contrast how an organizaton would function were it to apply this one derivation and establish well-knit groups with high performance goals, instead of adhering to the traditional man-to-man

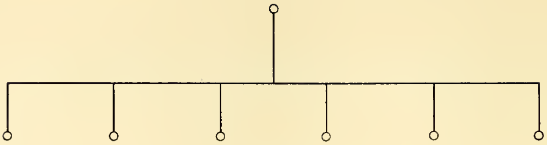

Figure 4

pattern. First, let us look briefly at how the traditional man-to-man pattern usually functions. Figure 4 shows the top of an ordinary organization chart. Such an organization can function on a man-to-man basis, as shown in Figure 5A, or on a team basis as shown in Figure 5B. In Figure 5A, the president, vice-presidents, and others reporting to the president are represented by O's. The dotted lines indicate the boundaries of well-defined areas of responsibility.

The president of such an organization has said to us:

> I have been made president of this company by the board of directors because I am more intelligent, better trained, or have more relevant experience than my fellow managers. Therefore, it is my responsibility to make the top-level decisions.

He periodically holds meetings of the people who report to him, not for decision-making, but for purposes of sharing information.

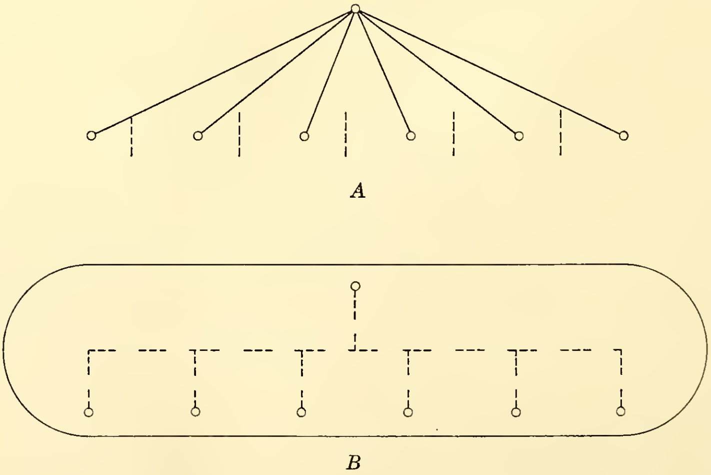

Figure 5

What happens? The vice-president in charge of manufacturing, for example, may go to the president with a problem and a recommendation. Because it involves a model change, the vice-president in charge of sales is called in. The president may and often does fail to recognize that the interests of other vice-presidents are involved and so does not ask for their recommendations. On the basis of the discussion with the two vice-presidents and the recommendations they make, the president arrives at a decision. However, in any organization larger than a few hundred employees, that decision usually will affect other vice-presidents and subordinates, whose interests were not represented in it. Under the circumstances, they are not likely to accept this decision wholeheartedly nor strive hard to implement it. Instead, usually they begin to plan how they can get decisions from the president which are going to be beneficial to them but not necessarily to sales and manufacturing.

And what happens to the communication process? This president, it will be recalled, holds meetings for the primary purpose of sharing information. But if the manufacturing vice-president, for example, has some important information bearing on an action which he wants to take, does he reveal it at these meetings? No, he does not. He keeps it to himself until he is alone with the president and can use the information to obtain the decisions he seeks from the president. Each vice-president is very careful to share in the information-meetings only information that is quite casual and insignificant, not really important facts which may affect the operation of the company as a whole. The motivational pressures in these staff meetings are not conducive to sharing important information.

Another serious weakness of the communication process in the man-to-man method of operating is that communications upward are highly filtered and correspondingly inaccurate. Orders and instructions flow down through the organization, and at times with some distortion. But the requests for information on the execution of orders and on difficulties encountered often result in incomplete and partially inaccurate information. With these and with other kinds of communication as well, those below the boss study him carefully to discover what he is interested in, what he approves of and disapproves of, what he wants to know and does not want to know, and what he wants to hear and does not want to hear. They then tend to feed him the material he wants. It is difficult and often hazardous for an individual subordinate in man-to-man discussion to tell the boss something which he needs to know, but which runs counter to the boss' desires, convictions, or prejudices. A subordinate's future in an organization often is influenced appreciably by how well he senses and communicates to his boss material which fits the latter's orientation.

Another characteristic of the man-to-man pattern (Figure 5A) concerns the point of view from which problems are solved. When a problem is brought to the president, it is usually stated and discussed with a departmental orientation despite efforts by the president to deal with it from a company-wide point of view. This operates to the disadvantage of the entire organization. Problems tend to be solved in terms of what is best for a department, not what is best for the company as a whole. Often decisions benefit departments but adversely affect the company as a whole.

Effect of competition between functions

In a situation represented by Figure 5A, it is perfectly clear that sharply defined lines of responsibility are necessary. This occurs because of the nature of the promotion process and because the men involved are able people who want promotion.

Now, what are the chances of moving up in such an organization or of being conspicuously capable and thereby getting offers elsewhere? Two factors are important: the extent of one's responsibility, and the definition of one's function so as to make successful performance easy. For example, if you are head of sales and can get the president to order the manufacturing department to make a product, or price it in such a way that it is highly competitive, that will be to your advantage, even though it imposes excessive difficulties on the manufacturing operation.

Each man, in short, is trying to get the dotted lines in Figure 5A pushed farther apart and thereby tends to encroach on the other's territory. He is also trying to get decisions from the president which set easily attained goals for him and enable him to achieve excellent performance. One consequence of this struggle for power is that each department or operation has to be staffed for peak loads; no one dares let anybody else take over any part of his activity temporarily, for fear that the line of responsibility will be moved over permanently.

Interestingly, the tighter the control in an organization, in the sense that decisions are made at the top and orders flow down, the greater tends to be the hostility between subordinates. In autocratic organizations, subordinates fight for power and status. Consequently, the greater the extent to which the president makes the decisions, the greater is the probability that competition, hostility, and conflict will exist between his subordinates.

Advantages of well-developed teamwork

Figure 5B represents a company patterned on the group system of organization. One president who seeks to use this system will not permit an organization chart to be drawn, because he does not want people to think in terms of lines connecting people. He wants to build working groups. He holds meetings of his top staff regularly to solve problems and make decisions. Any member of his staff can propose problems for consideration, but each problem is viewed from a company-wide point of view regardless of how it is stated when introduced. In the presence of the group it is not possible to solve a problem in terms of the best interest of a particular department but detrimental to others.

The fact that an effectively functioning group presses for solutions which are in the best interest of *all* of the members and will not accept solutions which unduly favor a particular member or segment of the group, is an important force in the group pattern of organization (Figure 5B). It provides the president, or the superior at any level in an organization, with a powerful managerial tool. This tool is very effective in dealing with the problem of how to handle special requests or favors from subordinates, including requests which the subordinate may feel are legitimate but are not in the best interest of the organization. In the man-to-man operation (Figure 5A), the chief sometimes finds it difficult to turn down such a special request from a subordinate. Sometimes he may be virtually blackmailed into approving it. With the group pattern of operation, however, the superior can readily handle such requests, by merely telling the subordinate to submit his proposal to the group at the next staff meeting. This usually will kill requests for unreasonable favors or treatment. If not, an effectively functioning group can skillfully cope with the request by analyzing it in relation to what is best for the entire organization. Subordinates in this situation soon find they cannot get special favors or preferred treatment from the chief. This leads them to establish the tradition that one does not ask for any treatment or decision which is recognized as unfair to one's colleagues. With the group form of operation, members soon learn to seek only those decisions which are likely to be in the best interests of the group and the organization, as well as of themselves.

When it comes to decision-making, all the persons in the group reporting to the superior (for example, the president) contribute their technical knowledge—sales, engineering, manufacturing, and so on—but they also make other contributions. One member of the group, for example, may be the imaginative type of person who comes up rapidly with many stimulating and original ideas. Others, such as the general counsel or the head of research, may make the group do a rigorous job of sifting ideas. In this way the different contributions required for a competent job of thinking and decision-making are introduced.

In addition, in the Figure 5B model, these people become experienced in effective group-functioning. They know what leadership involves. If the president grows absorbed in some detail and fails to keep the group focused on the topic for discussion, the members will help by performing appropriate leadership functions, such as asking, "Where are we? What have we decided so far? Why don't we summarize?"

There are other advantages to this sort of group action. The motivation is high to communicate fully and accurately. If any one of these men holds back important information affecting the company so that he can take it to the president later, he is likely to be asked by the president why he withheld the information and requested to report it to the group at the next session. The group also is likely to be hard on any member who withholds important information from them. Moreover, the group can get ideas across to the boss that no subordinate dares tell him. This reduces "yessing" the boss and feeding him filtered information. As a consequence, there is better communication, which brings a better awareness of problems, and better decision-making.

Another important advantage of effective team action is that there is high motivation on the part of each member of the group to do his best to implement the decisions made and to achieve the group goals. Group members, as we have seen, are highly motivated to achieve goals set by the group. Moreover, since the goals of the group are arrived at through group decisions, each individual group member tends to have high ego-identification with the goals because of his involvement in the decisions.

Finally, there are indications that an organization operating in this way can be staffed for less than peak load at each point. When one man is overburdened, some of the others around him can pick up temporarily part of the load. In a team situation this is possible because the struggle for power and status is less. Everybody recognizes his broad area of responsibility and is not alarmed by occasional shifts in one direction or the other. Moreover, he knows that his chances for promotion depend not upon the width of his responsibility, but upon his total performance, of which his work in the group is an important part. The group, including the president, comes to know well the strengths and weaknesses of each member as a result of working closely with him.

Other advantages of the group form of organization could be mentioned, but the above serve to illustrate their general character. It should be emphasized that this pattern of organization does not reduce the superior's responsibility for making certain that the job is well done. It does, however, enable subordinates to pick up some of this responsibility when the superior fails to function adequately. Consequently, it increases rather than decreases the total feeling of responsibility. Fundamentally, it is each member's duty to see to it that the group faces its problems and produces the right decisions at the right time in the best way. If the group cannot reach a consensus within the necessary time, or if the decision is not adequate to meet the requirements of the situation,[1] the man in charge must make sure that adequate action is taken. He still has full responsibility for seeing that the job is done and done well. The group cannot relieve him of that responsibility by any action it takes.

An interesting example of the power of the group form of organization occurred recently. And it was in a field where many persons would least expect it—the creation of fashions. The following account which appeared in *The New York Times* of January 31, 1958, tells the story:

> PARIS, Jan. 30—Rarely does a hoped-for miracle come off just on time and in full splendor, but it can happen. No planned tribute to the late Christian Dior could possibly have been a bigger success than today's two showings—first for the press in the morning and second for the buyers in the afternoon. Dior was the couturier who, for the last ten years, headed the largest dress-making business in Paris.
>
> Younger than springtime, today's magnificent collection has made a French national hero of Dior's successor, 22-year-old Yves St. Laurent, and comfortably assures the future of the house that Dior built.
>
> . . . .
>
> The most encouraging thing about St. Laurent's success without Dior is that it proves that a production-line, team-work set-up is possible, and desirable, in even the highly individualistic French haute couture.
>
> Couturiers have been, by nature, one-man shows. The weakness in this is indicated by the fact that, when Jacques Fath died, even the clever

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[1] For a more complete discussion of how a leader should use objective facts as "situational requirements" to motivate thinking and action, see *Leadership Patterns and Organizational Effectiveness*, report of a seminar conducted by the Foundation for Research on Human Behavior, Ann Arbor, 1954, pp. 2–5.

Madame Fath was able to carry on only a few seasons without him. If Balenciaga were to quit tomorrow, his house would probably fold the following week.

Luckily, Dior operated differently. Both he and his financial backer, Marcel Boussac, realized the inherent danger of having all their eggs in one man's basket. As early as 1947, they thought in terms of a team. Guided by this foresight, they built up the best team that money could buy.

Today it is guided by Mme. Raymonde Zehnacker, who was apprenticed in dressmaking at 14 and had twenty-two invaluable years at Lucien Lelong, five of which were years when Dior also worked there.

Another member of the team, Mme. Marguerite Carre, also was apprenticed to the couture early. She perfected her training at Worth and Patou, and went to work for Dior in the late Nineteen Forties. She knows fashion from the ground up and, with her great knowledge and experience, helps turn a sketch into the finished perfection expected of Dior clothes.

Mme. Mitzi Bricard adds the finishing fillips, especially the masterful hats and accessories. She, too, has a long couture experience, having started out with Mirande Doucet in the Twenties. Molyneux' right-hand woman for ten years, Mme. Bricard came to Dior in 1946.

The highly gifted St. Laurent, trained by Dior since 1953, shares the direction of the house with these three clever women. The sum total of their particular talents adds up to a Dior hallmark, a Dior look that is apparently indestructible. Dior himself would have been delighted today, and would likely have beamed as happily as the buyers.

The "linking-pin" function

Figure 5 and the preceding discussion have been concerned with the team pattern of organization at the very top of a company. Our theoretical derivation indicates, however, that this pattern is equally applicable at all levels of an organization as shown in Figure 3. For an organization to apply this system effectively at all organizational levels, there is an important linking function to be performed.

The concept of the "linking-pin" function is shown by the arrows in Figure 6. This concept was discovered first in an Institute for Social Research Study by Pelz (1951, 1952). In this study, involving

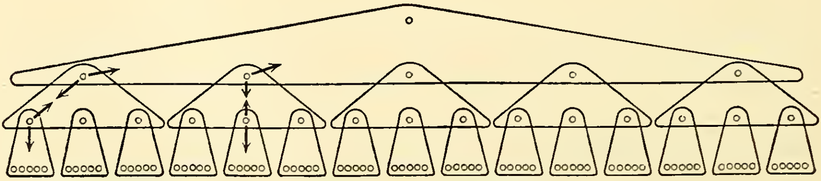

Figure 6

several hundred supervisors and several thousand non-supervisory employees, Pelz found that there was only a slight relationship between some fifty different measures of supervisory practices and attitudes, as reported by the supervisors, and the attitudes and morale of the subordinates. Pelz found that for most of the different supervisory practices studied, there were no statistically significant differences in the reactions of subordinates. When such population variables as size of work groups, kind of work, and length of service were held constant, there was an increase in the number of relationships that were statistically significant between supervisory behavior and subordinate response, but many of these relationships were negative or the opposite of those expected. He found, for example, that "giving honest and sincere recognition for a job well done" to a particular group of workers had a significantly negative relationship with morale: those supervisors who reported giving the most recognition were in charge of work groups who had the lowest morale. These particular groups consisted largely of white-collar employees who were over forty years of age with high school education or less. Katz, Maccoby, and Morse (1950) in an earlier study found similar, though less-marked discrepancies between supervisory behaviors presumed to be "good" and the responses of subordinates.

Pelz found that an important variable was responsible for these perplexing results. By further analysis he was able to show that the amount of influence which a supervisor felt he had with his own superior affected the response of his subordinates to his supervisory acts. When supervisors who had above-average influence or power with their own boss followed procedures which are generally considered to be good supervisory behavior, their subordinates tended to react favorably. However, when supervisors who were below average in the amount of influence they had with their superiors practiced these same desirable supervisory procedures, they usually failed to obtain a favorable reaction and not infrequently obtained an adverse reaction from their subordinates.

Pelz interprets his findings to mean that the amount of influence which a supervisor has with his own superior is a "conditioning variable" which affects the results the supervisor will achieve from his supervisory behavior. A supervisor, to function effectively, must have sufficient influence with his own superior to be able to affect the superior's decisions when required. Subordinates expect their supervisor to be able to exercise an influence upward in dealing with problems on the job and in handling problems which affect them and their well-being. These include action on such matters as flow of supplies and materials, scheduling, condition of equipment, safety and working conditions, pay, promotions, shift assignments, etc. As Pelz' analysis shows, when a supervisor cannot exert sufficient influence upward in the hierarchy to handle these problems constructively, an unfavorable reaction to the supervisor and to the organization is likely to occur.

Other research confirms the importance of Pelz' findings and also indicates that the ability to exert an influence upward affects not only morale and motivation, but also affects productivity and performance variables (Katz, Maccoby, and Morse, 1950; Likert and Willits, 1940). Ronken and Lawrence (1952) summarize their findings on this matter as follows:

> An additional complication for the foreman was the necessity of learning how to work with new supervisors and a new group of subordinates. When the foreman experienced difficulty in communicating with his superior, he was not able to understand his subordinates' problems or to gain their spontaneous cooperation, and the work suffered. When he felt more confident of his relations upward, he administered his own group with greater skill. During such periods his operators showed considerable initiative in their work, contributed more useful suggestions, and raced with themselves and each other to increase output.

These results demonstrate that *the capacity to exert influence upward is essential in order for a supervisor (or manager) to perform his supervisory functions successfully.* To be effective in leading his own work group, a superior must be able also to influence his own boss. That is, he needs to be skilled both as a supervisor and as a subordinate. In terms of group-functioning, he must be skilled in both leadership and membership functions and roles.

Effective groups with high group-loyalty are characterized, as mentioned on page 192, by efficient and full communication and by the fact that their members respect each other, welcome attempts by the other members to influence them, and are influenced in their thinking and behavior when the evidence submitted by the other members warrants it. The linking-pin function, consequently, will be performed well in an organization when each work group in the organization, at all the different hierarchical levels above the non-supervisory level, is functioning effectively as a group, and when each member of each group is performing equally well his functions and roles. Whenever an individual member of one of these groups fails to perform his functions and roles well, the group or groups under him will not be linked into the organization effectively and will fail to perform their tasks well. When an entire work group fails to function well as a group, the activities and performance of all of the work groups under such a group will be correspondingly adversely affected.

The importance of the linking-pin function for high performance by an organization and the importance of effective group processes in contributing to the success of this function point to the following:

A. An organization will not derive the full benefit from any of its effective groups, unless these groups are in turn linked to the total organization by means of overlapping effective groups, such as illustrated in Figures 3 and 6. The use of effective groups in one part or in scattered portions of an organization will fail, therefore, to achieve full potential value of such groups.

B. The potential power of the overlapping-group form of organization will be achieved only when all of the groups in the organization are functioning with at least reasonably good effectiveness. The failure of any group to function well will adversely affect the effective performance of the organization.

C. When a group fails to function well, the higher it is in the hierarchy, the greater is the adverse effect of this failure on the performance of the organization. The linking process is more important at high levels in an organization than at low, because the policies and problems dealt with are more important to the total organization and affect more people. Consequently, failure of the linking-pin function at higher echelons has correspondingly more serious effects than failures which occur at low levels in the organization.

D. To help maintain an effective organization even though some "linking-pin" persons are failing to perform this function properly, it will usually be desirable for superiors not only to hold group meetings of their own subordinates, but also to have occasional meetings over two hierarchical levels. This is to enable the subordinates under any one of their own subordinates who is doing the linking process poorly to help perform it and to make clear that a breakdown exists in the linking process.

The preceding discussion has illustrated some of the operational characteristics of an organization using the overlapping-group form of organization called for by the modified theory. As the discussion has indicated, small groups in which there is high loyalty to the group and to all group members, are particularly effective in achieving full and efficient three-way communication (upward, downward, sideward). This form of organization is also equally powerful, when functioning well, in providing a mechanism through which the exercise of influence can flow in all directions. The research on small groups has demonstrated that both communication and influence processes are highly effective in groups to which the members are attracted and have high loyalty.

The effective flow both of communication and influence contributes to an organization's capacity to function well. These processes also represent an important application of the general formula upon which the modified theory is based. To be given information, as well as to have the information which you possess sought, increases an individual's sense of personal worth and, consequently, is consistent with the general formula proposed on page 191. To be deprived of information which one needs and to have one's experience and knowledge ignored, are for most persons ego-deflating and rejecting and represent a violation of the general formula. A similar situation holds also for the capacity to exercise influence, as the following illustrates.

The behavior of an individual's superior and the general atmosphere in which all interactions occur in an organization depend upon the over-all objectives of that organization. When the objectives of an organization are basically in conflict with the needs and goals of an individual member of that organization, it is virtually impossible for the superior to behave in a supportive manner and at the same time serve the objectives of the organization. Whether a superior has the freedom to behave in a supportive manner will depend, therefore, on the extent to which the objectives of the organization are compatible or in conflict with the goals and needs of the individual. The proposed general formula, consequently, points to the necessity for a maximum degree of harmony, or at least compatibility, between the objectives of the organization and the relevant goals of all the individuals who are a part of the organization.

This does not mean that there are no actual or potential conflicts in interests and points of view among the persons and component groups who make up an organization based on the modified theory or are related to such an organization. On the contrary, conflict and differences always exist in healthy, virile organizations, for it is often out of such differences that new and better objectives, methods, etc., emerge. These differences lead to important progress. Effective organizations are characterized by extraordinary capacity to deal constructively with conflict and to resolve it. To perform this function they have three very important characteristics:

A. They possess the machinery to deal constructively with conflict. This machinery includes an organizational structure which facilitates constructive interaction between persons and between work groups.

B. The personnel of the organization are skilled in the processes of effective interaction and mutual influence. These include skills in leadership and membership roles, and in group building and group maintenance functions (Blake and Mouton, 1956; *Explorations in Human Relations Training,* 1953).

C. There is high confidence and trust among the members of the organization in each other, high loyalty to the work group, and high loyalty to the organization. This confidence and trust, and loyalty produce earnest, sincere, and determined efforts to find solutions to the conflicts. These solutions can be highly creative and represent a far better solution than any initially proposed by the conflicting interests (Metcalf and Urwick, 1940).

The central problem, consequently, becomes not how to reduce or eliminate potential conflict, but how to deal constructively with conflict. There is every reason to believe that an organization which possesses the above three characteristics possesses the motivations and the mechanisms to cope successfully with conflict. Effective, virile organizations are bound to have conflict. A good case can easily be made that conflict is necessary to provide the stimulation required to achieve the high motivation and creative ideas which are present in a successful organization. But conflict can only be productive when the organization is equipped to use it constructively. Bitter, unresolved conflict can immobilize or destroy an organization.

An organization, therefore, must have an interaction and mutual influence process such that, consistent with their goals and needs, all persons who have an interest in the organization and its activities are able to exert at least some influence on the over-all objectives and decisions of the organization, as well as to be influenced by them. This interaction process must function in such a way that the objectives and methods of functioning established for the organization are reasonably acceptable to all concerned and that major conflicts in interests have been reduced to a minimum. Consequently, in every organization it is important to have an interaction and mutual influence mechanism which achieves and maintains the highest possible level of compatibility between the goals of the individuals who are in the organization or affected by it and the over-all objectives of the organization.

This does *not* mean that *all* the goals of each individual should harmonize with the goals of all the others in the organization and with the over-all objectives of the organization. The goals and needs of the individual members which have no relation to the objectives and activities of the organization need not harmonize nor be compatible with these over-all objectives. A maximum degree of compatibility should exist but only between those goals and objectives which are important for the continued operation and effective functioning of the organization.

This fundamental conclusion is equally applicable to every kind of organization: industrial, governmental, or voluntary. A business organization, if it is to function well, needs to have objectives and decisions which represent a satisfactory integration of the goals and needs of all the major segments of persons involved: its shareowners, its suppliers, its consumers, its employees (including all levels of supervision and non-supervisory personnel), and its union(s). The objectives of governmental agencies, if they are to function effectively, must similarly integrate satisfactorily the goals and needs of all the different kinds of persons involved in their activities, such as employees, citizens, legislators, and office-holders.

Neither the goals and needs of individuals nor the objectives of organizations are stable and unchanging. The goals of individuals grow and change as persons interact with others. Similarly, the objectives of organizations must change continuously to meet the requirements of changed technologies, changed conditions, and the changes in needs and goals of those involved in the organization or served by it. The interaction process of the organization must be capable of dealing effectively with these requirements for continuous change.

For an organization to function effectively and to satisfy its members, the organization must have not only over-all objectives that are a satisfactory synthesis of the goals of its individual members, but must also establish sub-objectives for sub-units and specific goals for particular individuals which are related to and will implement the organization's objectives. Moreover, activities or processes for achieving these goals must be agreed upon. Both the establishment of goals and the agreement on the activity required to achieve these goals, involve contacts and interactions between the members of the organization. The character of these interactions determines the extent to which the objectives, specific goals, and procedures for achieving them will be accepted or rejected by each of the different members of the organization.

In every healthy organization there is, consequently, a continuous process of examining and modifying individual goals and organizational objectives, as well as the methods and rewards for achieving them. This continuous process is necessary for the objectives, methods, and rewards to fit new developments and changing circumstances. The modified theory specifies that this process must be of such a character that:

A. The relevant goals of persons in the organization, or related to it, develop so that these goals achieve a satisfactory level of compatibility between them;
B. The objectives of the entire organization and of its component parts are in satisfactory harmony with the relevant goals and needs of the great majority, if not all, of the members of the organization and of the persons served by it;
C. Each member of the organization has objectives and goals which have been established in such a way that he is highly motivated to achieve them and which, when carried out, will result in his doing his part in enabling the organization to achieve its over-all objectives;
D. The methods and procedures used by the organization and its sub-units to achieve the agreed-upon objectives are developed and adopted in such a way that the members of the organization are highly motivated to use these methods to their maximum potentiality;
E. The reward system of the organization is such that the members of the organization and the persons related to it feel that the organization yields them equitable rewards for their efforts in assisting the organization to achieve its objectives.

The overlapping-group form of organization offers a structure which, in conjunction with a high level of interactional and influence skills, is particularly effective in performing the processes required to develop an integrated set of over-all objectives for an organization and corresponding coordinated objectives for sub-units in the organization.

As a rule, these objectives which are developed for the entire organization and for units within it should, if the theory is valid, be objectives of which the organizational members will be proud. In most situations these objectives will be of recognized social value. This condition will occur, because the objectives which are established through the mutual influence process will be of a character to serve not only the immediate members of the organization but also the broader community in the form of customers, suppliers, and shareholders.

In an organization in which there exists widespread acceptance of the objectives coupled with pride in these objectives, and in which the objectives and goals of sub-units are consistent with the over-all objectives of the organization, the efforts of the members will be highly focused and polarized. This polarization will mean that the behavior of all members will be in the direction best suited to help the organization achieve its objectives.

Obviously, it is not easy to build the organizational structure and to develop in all members of the organization the mutual influence skills and the confidence and trust specified by the modified theory. The leadership and membership skills required are more complex and require more learning than the skills demanded by any other system of organizing human activity. This greater complexity and need for greater skill characterizes all aspects of the modified theory of management. It appears to be a more advanced and more complex form of social organization. The only justification for developing it and for learning how to use it in specific companies is the apparently greater power of the theory to enable the organizations which use it to achieve more successfully their objectives.

A Concluding Statement

Using the general formula stated on page 191, a form of organizational structure based on overlapping groups rather than the usual man-to-man pattern has been derived. This form of organization provides an interaction system with impressive performance characteristics, if the theory and experimental results upon which it is based are valid. To summarize, the character of this interaction system is as follows:

A. The Nature of the Organization.

1. *Structure.* The overlapping-group form of organization shown in Figure 3 appears to come closest to the require ments specified by the general formula. This form of structure is supported by the theoretical foundation used in its derivation. In addition, there is substantial research to show that the communication and influence processes are most effective in groups to which an individual feels highly loyal and is highly attracted. The highly effective communication and influence processes called for by the modified theory require an organizational structure which will facilitate these

processes. The evidence, both theoretical and experimental, indicates that the overlapping-group form of organizational structure meets these requirements better than any other form of organization now known (Cartwright and Zander, 1953). Consequently, the overlapping-group structure is the basic pattern of the modified theory.

2. *Atmosphere.* To function as specified, the organization needs to provide a supportive, ego-building atmosphere, one in which persons feel valued and respected and in which confidence and trust grow. The atmosphere needs to be permeated by ego-enhancing rather than ego-deflating and threatening points of view toward people.
3. *Personnel.* The organization needs to be staffed by persons with appropriate aptitudes and training to perform the functions for which they are responsible. But, in addition to these usual requirements, personnel need to have adequate interpersonal and group-process skills. They need a maximum degree of accurate sensitivity to the reactions of others. They also need at least a minimum level of skill in the leadership and membership roles necessary for the functioning of face-to-face groups.
4. *Established Relationships.* The members of the organization need to know the other members of the work groups and units of which they are part sufficiently well that a high level of confidence and trust exists and an effective flow of information and of influence has been established and works well. This requires a minimum level of stability in personnel assignments. Rapid turnover and shifts in personnel will prevent the establishment of these working relationships.
5. *Measurements.* The members of the organization need to have available to them accurate, current measurements which reflect the internal state of the organization, the relevant dimensions of its environment, and its present performance (Likert, 1958). These measurements should be available to all those members of the organization whose decisions affect any of these variables. These measurements are to facilitate sound decisions based on accurate, objective information and thereby to permit the "authority of facts" and the "law of the situation" to prevail (Metcalf and Urwick, 1940).

B. Operating Characteristics.

1. The general formula which has been proposed for the modified theory specifies conditions that lead to full, candid com-

munication. To give relevant information to others and to be interested in and receptive to the relevant information which they have is to behave in a supportive, ego-building manner. To withhold relevant information or to show no interest in information others seek to give us is to behave in a threatening and ego-deflating manner. To give information conveys trust and confidence in others and increases their sense of personal worth. To withhold information does the opposite. The conditions specified by the modified theory, consequently, lead to a full and efficient flow of all relevant information in all directions—upwards, downwards, and sidewards—throughout the organization. Communication throughout the organization is efficient. There are no blocks, no distortions, no filters. This full and open flow of useful and relevant information provides at all points in the organization accurate data to guide action, to call attention to problems as they arise, and to assure that sound decisions are made based on all available facts.

2. The general formula calls for a flow of influence comparable to the flow of information. To be receptive to relevant influence by others by giving honest and sincere consideration to what they propose is to behave in a supportive, ego-building manner. To be unreceptive to relevant influence from others is to behave condescendingly toward them and is ego-deflating, threatening, and rejecting. Moreover, for an individual to feel that he can exercise influence on relevant matters increases his sense of importance and personal worth. To feel one can exercise no influence leads to a decreased sense of personal worth and results in apathy and indifference. In organizations which effectively use the modified theory, consequently, every person feels, and is correct in feeling, that he can and does exercise influence upon the decisions and behavior of all those with whom he is in more or less regular contact. Through them he exerts at least some influence upon the entire organization.

As a consequence, personnel in organizations operating under the modified theory, in comparison to personnel in existing organizations, will feel that they exercise greater influence upon what happens in the organization. This will be true for personnel at every hierarchical level from non-supervisory employees to the head of the organization. It will be particularly true with respect to the individual's own unit or department. Coupled with this ability to exercise influence, the personnel in organizations using the modified theory will respond cooperatively to influence exerted upon them to a greater extent than will persons in organizations which use the existing pattern. Moreover, the application of the modified theory will result in a greater total amount of influence being exercised throughout the organization. This reciprocal influence-process will weld the organization into a tough, highly effective institution.

3. The efficient flow of communication and influence throughout the organization, which is achieved with the modified theory, has important consequences for decision-making. All the relevant information existing in the organization on a particular problem will flow to the point or points where the decisions on the problem are made. Not only will information flow efficiently, but in addition ideas, points of view, and suggested solutions will flow also to the decision-making points as a result of the influence process provided by the modified theory. As a consequence, sound decisions can be made based on much more adequate facts than is usually possible today.

The substantial amount of accurate information flowing through the organization will also result in the relevant parts of the organization being promptly aware of problems and being able to deal with them rapidly and effectively based on adequate facts. It will not take a crisis for the top of the organization to become aware of serious difficulties as is now so often true.

The participation provided by the influence process will also have important consequences. The over-all objectives of the organization, the objectives of the various departments, and the goals of work groups and of individuals in work groups will be in general harmony, and all will be polarized toward achieving the objectives of the organization. This will result in behavior efficiently focused and highly motivated to achieve the organization's objectives.

With regard to the decision-making process, the modified theory, of course, calls for decentralization. Every decision is made at the lowest possible level in the organization. Each unit or sub-unit is free to make only decisions affecting it and is charged with the responsibility for doing so. It does not make decisions for others. All decisions made at any level in an organization should, of course, conform with the broad policy-decisions made at higher levels. The reasons for decentralized decision-making are as follows:

(*a*) Decisions affecting only a particular unit or sub-unit should be made at that level, since usually more of the relevant information bearing on that problem will be available at that point.

(*b*) Decisions made at the lowest possible level increase motivation for the same reasons that the capacity to exercise influence increases motivation: there is increased involvement and an increased sense of importance and personal worth.

For these motivational reasons no unit should be permitted to make a decision which directly affects the well-being and activities of other units without their having a voice in the decision either directly or through representatives.

4. Stemming from these processes of effective communication and influence and decentralized decision-making, there is ego involvement on the part of individuals and groups in the organization as well as other forces which spring from the desire for a sense of personal worth. These produce a high level of effective motivation.

(*a*) The organization's objectives will be embraced by its members. Each will endeavor to implement these objectives since he will see them as objectives which, in part at least, he has helped create. He is aware that he has influenced them or can do so.

(*b*) More important, however, the specified goal of each work group and of each member will have been established through participation and mutual influence. Since the objectives of the organization represent an effective integration of the goals and needs of all the members of the organization, the members will recognize that the more adequately the organization's objectives are met, the greater will be the extent to which each will realize his own goals and desires. This will result in the members setting high performance goals for themselves and their work group.

(*c*) The motivation to achieve both individual and group goals springs from several sources. One source is the individual's involvement in the goals established through the interaction process. Another is the individual's own personal needs. Since these needs are integrated into the organization's objectives, the individual will see that behaving so as to help achieve the organization's objectives will help him achieve his own needs. Another important source of the high motivation of each individual springs from the individual's attraction and loyalty to his work group and his desire to be valued by the members of the group. The ego-recognition and sense of personal worth which the work group can give, or fail to give, to a member is a major motivational force towards behavior in ways which will implement the goals of the group. Each individual, as a consequence, is usually motivated to behave in ways consistent with what he feels the group expects of him. These "reciprocal expectations" or "role expectations" are powerful motivating forces. If the modified theory is valid, those parts or units of a company whose pattern of operation more nearly approximates the conditions called for by the theory should, on the average, achieve better performance than do the units which deviate from the theory.

C. Over-all Performance Characteristics.

An organization should be outstanding in its performance if it has the overlapping-group form of structure, effective communication and influence, decentralized and coordinated decision-making, and high performance goals coupled with high motivation. We would expect such an organization to have high productivity, a high-quality product, low cost, low waste, low turnover and absence, high capacity to adapt effectively to change, a high degree of satisfaction on the part of its employees, customers, and stockholders, and good relations with unions. In short, it would be an ideal organization, a theoretical model toward which existing organizations can move.

The validity of these concepts and derivations as well as of the modified theory itself can be tested in two ways. The theory and the derivations can be applied experimentally in test or pilot plants to see whether they significantly improve all aspects of performance, including productivity, quality, costs, employee satisfaction, etc. This kind of test is underway, although it will take several years to know the results.

The second kind of test which can be used to evaluate the modified theory is to examine the extent to which the methods and procedures called for by the theory, or by the derivations based on the theory, are associated with above-average performance in the current operations of the companies.

This second kind of test can be made now and does not require waiting for the outcome of an experimental application of the theory. Several tests of this latter kind have recently been made. These tests were based on data which were already available, having been collected during the past few years. The results indicate that the modified theory skillfully used will produce an organization such as described above in paragraph C, Over-all Performance Characteristics.

The evidence suggests also that the full and effective application and use of the modified theory will not be easy. It requires, as this chapter has indicated, a more complex form of social organization than companies use at present. This in turn requires not only the form of structure presented in this chapter, but requires also the loyalties and interpersonal skills which have been briefly described. These skills are difficult to acquire. They demand more learning, more understanding, and more practice than is now usually expected of workers, supervisors, and managers.

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ROBERT DUBIN

8.

Stability of Human Organizations

DECISIONS ARE MADE TO GUIDE THE COURSE OF HUMAN ACTION. Two general outcomes of decisions are possible: (1) to select a new course of action different from that being pursued; and (2) to choose the present course of action as the best among available alternatives, thus continuing on-going activities unchanged.

Both decisional outcomes have a basing-point in present action. Where a decision favors change, it is a change from present action. Where the decision rejects change it sustains present action.

The study of decision-making in organizations must then be rooted in a conceptual model of the organization as a stable set of systems. A central problem for organizational decision-makers is to choose between maintaining the systems of action "as is," or changing them in desirable and feasible directions by desirable and feasible amounts. This may be called the "context facet" of organization decision-making.

Decision-making can also be analyzed as a process. From this standpoint the amount and order of information; the logics for formulating alternative outcomes; the interpersonal relations among group decision-makers; the technical skills of individual decision-makers, and their organizational roles—all become the subjects of study. This may be called the "process facet" of organization decision-making. In general, the "process facet" has been more widely studied than the "context facet" of decision-making.

The focus of this chapter is on the context of decisions. In particular, the organization—whose systems of action are affected by decisions—will be central to the analysis. Two general propositions run through the analysis:

A. the context of a decision is limited by the plasticity to change of established behavior-systems; and
B. a decision becomes operative only when supported by stable behavior-systems.

The outline of the analysis is as follows: We will first examine major systems of linkages among units of an organization. Formulas for computing number of linkages from number of units in a system will be presented. Then contrasts will be drawn among the various linkage systems concerning their stability. The second major section of the chapter deals with the stability of individual organization units. Here attention centers on the employee, his working-life history, and his relations with fellow workers as sources of work-group stability. Major dislocations in work-unit stability that have their origin in the employing organization will be examined. The final section of the chapter summarizes some examples of the strategies involved in executive decision that have basing-points in the stabilities of human organizations.

System Stability

By system stability we mean the stability of the entire organization. We will examine system stability in terms of one principal facet of it. The emphasis is on the linkages among units composing a system of interdependence. In an organization such units are the sections, departments, and divisions among which the specialized tasks of the organization are divided.

Lest this be condemned as undue attention to a "mechanical model" of organization, appropriately laid to rest in a recent treatise (March and Simon, 1958), it cannot be too strongly emphasized that the systems of linkages discussed below represent the mainstreams of organization. It is along the lines of linkage among organization units that work flows. These are the channels through which pass information, ideas, communications, and orders. Authority relations of an organization are a central, structural feature of many systems of linkage among units. Motivation for work is one product of the organizational division of labor, and the means by which the division of labor is held together. Finally, the personnel program of any organization, including the status-rankings of jobs, positions, and offices; the differential rewards accorded among them; and the principal lines of advancement and promotion—all can be represented as products of the linkage-systems among organization units.

In short, our apparent concern with the mechanics of systematic ties among the divisions, departments, and sections of an organization is directed at providing a set of models for explicating the *human* consequences of having one's labor dependent on the work of others. We are equally concerned with the *organizational* consequences of linkage systems among units, particularly as they affect the operating limits within which executive decisions must be made.

Systems of unit linkage

There are three fundamental patterns of linkage among organization units. Such units may be linked in a series; they may be linked through a radial like the hub of a spoked wheel; or linkages may be among units arranged on the circumference of a circle. We will also examine three derived linkage-systems that represent combinations of radial and serial, radial and circular, and serial-radial-serial. It will be shown that all these patterns are typical ones to be found in modern organizations.

Units may be linked in a series. In this pattern organization components are lined up so that each unit is linked only with the adjacent units on each side of it. This is the simplest system of linkage. The number of links among units for such a system is given by the formula: Links $= S - 1$, where S is the number of units in a serial. Thus, there is always one less link than there are units in a serial system of organization. See Figure 1 for pictures of the linkage systems analyzed here.

A serial linkage-system is the simplest line type of organization. It characteristically appears as a vertical serial, with units of highest authority at the top, and those of lowest authority at the bottom. A serial linkage-system is also a characteristic work-flow system, or a horizontal system, relating units through which work in process passes.

The second basic pattern of linkage is a radial one. In the pure pattern, one unit is linked to all the others. The number of links among units for a radial system is: Links $= R\ (U - R)$, where R

is the number of radial-focus units, and U is the total number of units in the system. A radial-focus is the unit linked to all the others.

The typical radial-linkage pattern is the one in which several units are subordinated to, or coordinated through, a radial-focus unit. This is a vertical pattern. A horizontal radial pattern is revealed in the instance of general-service departments, linked to all organization units through a service, control, or reporting function.

The least common basic pattern of organization-linkage is a circular one. In such a system, all units are linked to all other units. The number of links among units for a circular system is:

$$\text{Links} = \frac{C(C-1)}{2}$$

where C is the number of units in the circle.

An example of a circular linkage-system is that of a representative governing board of an organization, where subordinate units are represented on the governing board. Through representatives all units are linked to all others, at least during periods of board meetings.

The first derived linkage-pattern is the combination of a radial and a serial. The number of links among units for a radial-serial system is:

$$\text{Links} = R(U - R) + (S - 1)$$

where R is the number of radial-focus units, S the number of units in the serial, and U the total number of units.

But $$U - R = S$$

Hence $$\begin{aligned} \text{Links} &= RS + (S - 1) \\ &= S(R + 1) - 1 \end{aligned}$$

This is the general formula for the number of linkages among n radial-focus units and one serial. The formula can be readily extended to include systems containing n radial-focus units and r serials. For our purposes we will consider only the simpler case defined by the formula.

An example of a vertical radial-serial system is the coordination by one unit of other serially related units. A horizontal radial-serial is exemplified by a cost-accounting department linked to production units that are serially tied together in a work-flow process.

The second derived unit-linkage pattern combines a radial and a circular system. The number of links among units of a radial-circular system is:

$$\text{Links} = R(U - R) + \frac{C(C - 1)}{2}$$

where R is the number of radial-focus units, C the number of units in the circular pattern, and U the total number of units.

But $$U - R = C$$

Hence $$\text{Links} = RC + \frac{C(C - 1)}{2}$$

$$= \frac{2RC + C(C - 1)}{2}$$

$$= \frac{C(2R + C - 1)}{2}$$

This is the general formula for the number of linkages among n radial-focus units and one circular system, which can be readily extended to include more than one circular system. We will only use the case defined by the formula in this discussion.

The most ready illustration of a radial and circular system is that of a board composed of representatives of organization units which in turn is advisory to an executive office exercising direction over the same units.

The last general system we will consider is the linkage of a vertical and horizontal serial through a radial. The number of links among units for a serial-radial-serial system containing one radial linking two serials is given by the formula:

$$\text{Links} = (S_1 - 1) + RS_2 + (S_2 - 1) + 1$$

where S_1 is the number of units in the first serial, R is an independent radial-focus unit, and S_2 is the number of units in the second serial.

$$\text{Links} = S_1 + S_2(R + 1) - 1$$

Again, this formula may be generalized to include combinations of more than one radial and/or vertical and horizontal serials.

The serial-radial-serial system is the basic organization pattern of a typical line organization. Gulick (Gulick and Urwick, 1937) has distinguished organization by *purpose* from organization by *process.* A serial-radial-serial system of linkage among organization units ex-

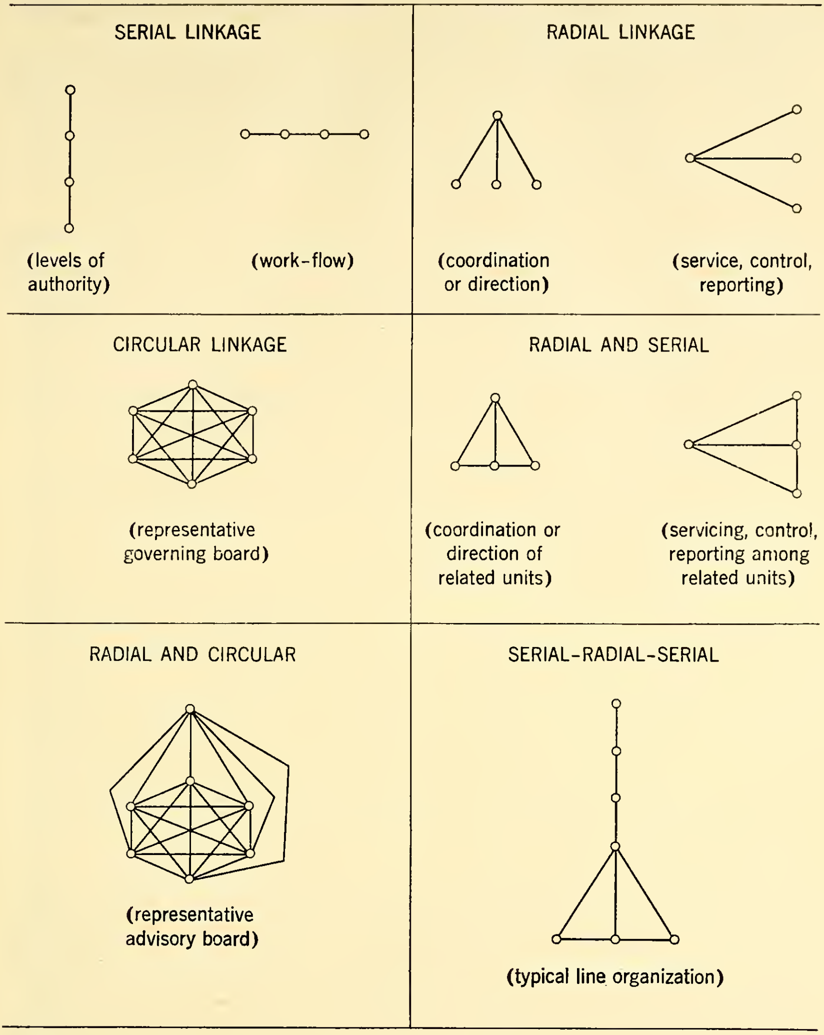
SERIAL LINKAGE
(levels of authority)
(work-flow)
RADIAL LINKAGE
(coordination or direction)
(service, control, reporting)
CIRCULAR LINKAGE
(representative governing board)
RADIAL AND SERIAL
(coordination or direction of related units)
(servicing, control, reporting among related units)
RADIAL AND CIRCULAR
(representative advisory board)
SERIAL-RADIAL-SERIAL
(typical line organization)

Figure 1. Unit linkage-systems in organizations.

hibits both grounds for designing organization structure. The vertical-serial represents the purpose specialization, and the levels of unit-authority assignment within it. The horizontal-serial represents process-specialization within the single-purpose unit. The two are linked together through the radial-focus unit. Thus, the most common linkage-system among units of an organization is a series of serial-radial-serial systems joined together through one or several of the six systems of interconnections here described.

We have now described some basic types of linkages among organization units. The next step in the analysis is to consider the organizational and human consequences of these various linkage-systems.

Stability effects of linkage-systems

This analysis focuses on stability of human organizations. We are particularly concerned with searching for structural features of organization that are more stable than others. We can pose the problem in two ways. First we ask: Do participants in organizations operate from a minimizing stance, preferring to minimize the total number of linkages between their own work and that of others? The second question views the same issue from the standpoint of organization management: If the number of units of the organization is to be changed, does the criterion of minimizing the number of linkage-additions, and maximizing the number of linkage-subtractions, among all units, provide a guide for decision?

In their discussion of "classical" organization theory, the Carnegie Group (March and Simon, 1958) pose a central problem of traditional theory, the "assignment problem." As usually stated, the assignment problem is that of maximizing the return to the organization through the "best" assignment of persons to jobs (for example, Kuhn and Tucker, 1953). March and Simon revise the assignment problem by defining it as the search for the minimum number of tasks required to perform the whole set of organization activities (March and Simon, 1958, pp. 23 ff.).

I would suggest that neither "best" assignment of persons to jobs, nor minimizing the number of tasks, are sufficiently inclusive definitions of the assignment problem. It is also necessary to take into account the *structure* of interrelationships among the jobs. Some structures require many more linkages than others for the same number of units (e.g., for ten total units there are nine links in a serial, seventeen in a radial plus a serial, and forty-five in a circular system). Indeed, I would be presumptuous enough to suggest that the satirical Parkinson's Law—"Work expands so as to fill the time available for its completion"—(Parkinson, 1957) is itself grounded in the Law of Linkage for Parkinsonian administrators, *viz.:* Maximize the number of linkages among organization units and work will *have* to expand to maintain them![1]

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[1] The Law of Linkage was stated, but not explicitly recognized by Parkinson, in this commentary: "Those who doubt the stability of an economy based upon

Our analytical problem is this. If we focus on the linkages among organization units, will this clarify the understanding of organization stability and instability? We have translated the "assignment problem" of classical organization theory into the issue of how many linkages are required to maintain connections among working units. From this standpoint, our general conclusion is that linkage systems are crucial to stability. Some linkage systems are less stable than others; some have very specialized application to the solution of structural problems; and some kinds of changes from one type of linkage-system to another may be maximally unstabilizing. We will discuss the comparative-stability problem now, reserving for the concluding section of the paper the analysis of special applications of linkage-systems, and the stability consequences of changing from one type to another.

We can examine the comparative stability of organization linkage-systems from two standpoints. For a given number of units we can compare the number of links among them, defined by the system type. We can also examine the stability problem by comparing the number of linkage changes required by the addition or subtraction of one unit from the system.

For illustrative purposes, Table 1 exhibits the number of links among two to ten units for the six linkage-systems previously described. The number of linkages is calculated from the formulas already given.

Examination of any row of Table 1 shows the comparative number of links required in each linkage-system for the same number of total units. It is clear from Table 1 that there are material differences among the various linkage-systems in the number of connections required to bind together a given number of organization units. For example, a simple serial or a simple radial require the least number of links. A serial-radial-serial system (already indicated as the common line organization) is next most economical in number of linkages used. On the other hand, a circular system, or its variant, a radial plus a circular, demands the greatest number of links among units.

If we assume that minimizing the number of links among organization units contributes to stability of the system, then it follows that some types of linkage-systems are manifestly more efficient for stability than others. (We will analyze the minimizing assumption in a

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reading each other's minutes [reports and memoranda] . . . ." (Parkinson, 1957, p. 13). Obviously, we intend no discredit in amplifying the base of Parkinson's Law since great analytical discoveries are notoriously incomplete in their initial explication.

Table 1

Number of Links among Organization Units in Six Linkage-Systems

Total Number of Units in System	Number of Links among Organization Units										
	Serial System	Radial System		Radial-Serial System		Circular System	Radial-Circular System		Serial-Radial-Serial System	
		One Radial	Three Radials	One Radial	Three Radials		One Radial	Three Radials	One Unit in Vertical Serial	Three Units in Vertical Serial
2	1	...	...	...	...	...	...	...	...	...
3	2	2	...	3	...	3	...	...	...	...
4	3	3	3	5	3	6	6	...	4	...
5	4	4	6	7	7	10	10	...	6	...
6	5	5	9	9	11	15	15	12	8	6
7	6	6	12	11	15	21	21	18	10	8
8	7	7	15	13	19	28	28	25	12	10
9	8	8	18	15	23	36	36	33	14	12
10	9	9	21	17	27	45	45	42	16	14

moment.) Given a choice among various types of linkage-structures, with no limiting conditions on the choice, clear preferences exist in designing organization structure.

The preferences in organization linkage-structure would remain the same, if we examine the consequences of adding or subtracting a unit from a given linkage-system. This can be determined by comparing the successive entries in the columns of Table 1. For example, making a change of one unit in a serial changes the number of linkages by one, while a similar change in a circular system produces a change of n links (where n is the final number of units in subtracting, or the starting number of units in adding). The other linkage-systems fall in the same relative position between these extremes as was true when we examined the total number of links required.

We conclude that linkage-systems among organization units differ significantly in the number of links necessary to connect units. This is true whether we consider the number of links for the same number of units, or the number of linkage changes with a change in number of units.

What about the assumption that minimizing the number of linkages among organization units contributes to system stability? We could argue from a principle of parsimony and accept the principle as sufficient proof of our law relating stability to number of linkages. There is, however, some theoretical and empirical support for the law.

Given the problem of simultaneous stimuli being received by an organization unit or person (e.g., orders, plans, requests for information, services, the exercise of controls), how are the stimuli sorted by the receiver in order to provide the bases for response? Is there the potentiality of "stimuli-saturation," so that with a sufficiently large number of simultaneous stimuli it becomes difficult or impossible to respond to all (either because the stimulating cues become confused, or because the time available for response is insufficient to make all the required responses)? In short, can there be too many linkages between one organization unit and others so that simultaneous activation of these channels of linkage may make it impossible to evoke efficient, legitimate, or timely responses? The answers to these questions illuminate the "linkage problem" for organizations.

A series of early psychological studies has shown that the distortion in transmitting a unit of information increases with the number of steps through which the information passes (Bartlett, 1932). Bartlett has shown, for example, that a line drawing of an owl, when redrawn by eighteen individuals, one after the other, after having seen a predecessor's sketch, ended up as a recognizable cat. The fewer number of steps away from the initial drawing, the more the reproductions looked like it. This suggests that too many successive links produces major distortions in transmittal.[2]

In a major reinterpretation of conditioning, Broadbent has suggested the possibility of extinction of impact by competing stimuli (Broadbent, 1953). This extinction is to be distinguished from that resulting from competing responses. He further suggests a hierarchy of stimuli in terms of intensity, biological importance, and novelty, which determines success among competing stimuli. Broadbent's work implies "stimuli-saturation" plus sorting-criteria by which certain stimuli may come to dominate over others.

Another common phenomenon dealt with in communication theory is that of "channel overload" (Attneave, 1959; Quastler, 1955). The general problem is that of determining the effects of increasing the volume of transmission in a channel on the ability to receive what is transmitted. The volume of a single stimulus is increased (usually by sending at an increasing rate). The characteristic response of the receiver is to increase unequivocal reception if the starting point was a reasonable level. Reception then begins to plateau and fail to increase with a further increase in the rate of transmission. Beyond the plateau, reception will drop off markedly because the receiver becomes overloaded with transmitted cues, resulting in confused reception.

By analogy we may reason that the channel-overload phenomenon may be generalized to multiple-simultaneous stimuli. We would expect that characteristic falling-off of reception will ultimately occur when the volume of simultaneous stimuli exceeds the ability to receive them. In organization terms, there may be too many linkages between one unit and others, so that if all linkages are simultaneously activated, little or none of what is transmitted along the linkage channels will be effectively received. The consequences for the receiving unit may be confused action, evasive action, or general inefficiency (Weaver, 1955). This, then, buttresses our basic conclusion that minimizing the number of links among organization units promotes stability in the organization.

A final clue supporting this conclusion comes from still another aspect of information theory, the phenomenon of "noise." In general, noise is the introduction of random cues in communication, usually associated with the transmission system or external sources as engineering noise. Weaver has also pointed to "semantic noise" as the distortions of meaning introduced by the information source (Weaver, 1955). Given an organization unit subjected to simultaneous cues from different sources along channels linking with these sources, the cues from one source may be interpreted as "noise" from the standpoint of cues from another source. Thus, the receiving unit might eliminate the cues from the first source as irrelevant in responding to the cues from the second source. Again, we might conclude, all other things being equal, that the greater the number of links in the system, the greater will be the probability of "noise" in functional connections among organization units. This becomes particularly critical where multiple links to a unit exist so that the chances of simultaneous cues being received is great.

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[2] I am indebted for suggestions regarding communication theory here used to my colleague, Professor Fred Attneave, Department of Psychology, University of Oregon.

So much for some theoretical clues giving plausibility to the law that stability of organization systems varies inversely with the number of links among the units composing the organization. We can also find some empirical results that seem to fit the theory.

Worthy has suggested that "flattening" the management structure by reducing the number of levels of managers has had positive consequences for morale among employees of Sears Roebuck and Company (Worthy, 1950). This finding, that reducing the number of units in a vertical-serial produces desirable effects for the organization, accords with our theoretical expectation that reducing the number of linkages stabilizes the system. Selznick's study of the TVA administration (Selznick, 1949) points out that delegation of authority led to the rapid proliferation of organization units with the dysfunctional consequences of actual or potential conflict between organization goals and sub-unit goals. What is particularly important among his findings, for our purposes, is that a significant number of units in TVA were organized in circular and radial patterns of linkage. We have already seen that these patterns of linkage require relatively more links among units than serials. Consequently, we might conclude that the conflict he describes is one index of organization instability, which we would attribute to the unit-linkage systems used. Gouldner's study of the gypsum mine and plant (Gouldner, 1954) presents data contrasting a "leniency pattern" of plant management with a successor administration concerned with close supervision. The unstabilizing effects of the successor administration (which is documented in the study) can be attributed at least in part to the added links between the work groups and top plant management that were entailed when close supervision was employed. Whyte's study of industrial relations in a container plant suggests that minimizing the number of linkages between management and union officers was a factor in the development of effective relationships (Whyte, 1951). The "open-door" policy of many top managers (honored more in the breach than the observance) is clearly based on minimizing the number of linkages to the working level. Walker's work group in the automatic, seamless-tubing plant complained bitterly when, after the automated equipment was finally "run in," top plant managers ceased making frequent plant visits to see how things were going—a direct recognition by workers of the linkage problem (Walker, 1957). Wilensky presents data on the problems of union staff men fitting effectively into the organization, part of which can be attributed to the fact that they were units in a circular linkage-system in relation to top union officials, and radial-focus units in servicing union locals—both "expensive" types of linkage-systems (Wilensky, 1956).

Perhaps the most satisfactory data suggestive of the stable solution of the linkage problem is the series of experiments initiated by Bavelas (1950), carried forward by Leavitt (1951), and elaborated by Heise and Miller (1951), and Guetzkow and Dill (1957). All of these laboratory experiments deal with individuals performing tasks in prescribed patterns of communication interaction. The most general conclusion from these studies is that the number of linkages among the individuals composing a closed group is a significant determinant of group effectiveness.

Heise and Miller show for their three-person groups, in the sentence-construction task (the only one used by them that required continuous interaction for its performance), that a two-link system is more efficient than various three-link systems with which they contrasted it. They measured efficiency by the number of words spoken and the time taken to complete the task.

From the Guetzkow-Dill experiments, an added finding has extremely important significance for our general conclusion: when given the opportunity to reorganize the group for task purposes, its members chose minimum linkage-systems. The Guetzkow-Dill experiments were designed to investigate the self-structuring of group activity by five-man teams in task performance. They replicated Leavitt's puzzle-solving problem. In two-minute inter-trial periods the team members were permitted opportunity to communicate on any subject. Out of these inter-trial conferences came self-structuring of the task activities within the limits imposed by the communication system permitted while performing the task.

By the end of twenty trials, seventeen out of twenty groups organized in a circular linkage-system (called all-channel by Guetzkow-

Dill) had self-organized their task to require only four linkages among the five individuals, as contrasted with the starting ten links permitted by the initial circular linkage-system. All fifteen groups organized on a simple, radial system which calls for four links among five members, retained four linkage-systems (either as simple radials called a two-level hierarchy by Guetzkow-Dill, or as a radial connected to two two-unit serials, labeled a three-level hierarchy by them). Thus, none of the groups initially structured with a minimum possible number of links among members ever organized into a complex linkage-system.

Finally, among groups organized as a closed serial (the end units being connected with each other, requiring five links among five team members, called a circle system by the experimenters), ten out of twenty-one groups reorganized themselves into a system requiring four links. Thus, among half of these experimental groups, where the number of permitted links was only one short of the minimum possible, the group determined to simplify its structure by reorganizing to the minimum linkage-system.

Guetzkow-Dill conclude that the groups that did *not* reduce the number of links in their linkage-system took more time to perform their tasks than the groups that did. This leads to the inference that fewer links among individuals in a team promotes efficiency.

The big result of the Guetzkow-Dill experiments for our purposes is this. Where a group of individuals is originally constrained to interact in interpersonal linkage-systems requiring more than the minimum number of links, they will, if given the opportunity, reduce the linkage system to the minimum. We would additionally infer from their data that the greater the departure from the minimum number of links, the greater is the self-generated pressure to reorganize the closed group into a minimum linkage-system.

These experimental data, where the unit is the individual operating in a closed group, suggest the efficiency of minimum linkage-systems. The self-recognition of this efficiency-effect is revealed in the participant's free choice of a minimum linkage-system when given the opportunity. The big problem is to determine whether the same generalization which holds for individuals holds also for linkages among groups. We are inclined to accept the generalization as not disproved and, indeed, at least given strong inferential support. We must now await some empirical studies of inter-unit linkage-systems to make a direct test.

This does not exhaust the available data. The evidence seems to suggest that a view of organization stability that centers on the linkage problem among organization units may be a useful analytical tool.

The argument may be summarized briefly. A unit is part of an organization if it has at least one link with a member unit of the organization. Links among units are the mainstreams of organization: channels of information, authority, work-flow, and personnel mobility. Systematic ways of connecting units vary in the number of linkages required. If stability of the organization is a desirable goal, then choices may be made among unit linkage-systems according to the criterion of minimizing the number of links. There are theoretical reasons and empirical evidence to support this criterion.

Unit Stability

We now turn attention to the sources of stability *within* operating units of an organization. Here concern shifts to the more intimate working-environment of people, the group in which they actually work, and with which they are in constant and repeated contact. This intimate environment of work has been the aspect of working most studied by human-relations researchers.

The analysis will be directed along two lines. We will first examine the internal bonds of a work group—the tangible and intangible commitments people make to each other in becoming intimate associates. These bonds of association will be described briefly in order to clarify our central concern: How do the bonds of human association bind people together in stable relationships? Stability of close human association is obviously a source of resistance to change. The nature of such resistances is best understood through an analysis of the bonds of association that may be ruptured by the change.

The second point of analytical attack is to consider group processes by which working associates present a united front to the organization in which they work in order to resist changes affecting the group as a whole. Here we make the complete circle back to our initial concern with system stability. In the previous section we analyzed system stability from the standpoint of the system. We will now direct attention to system stability from the standpoint of the individual units composing the system.

Careers and unit stability

Our first consideration is with work viewed as a career by the person. A career is an important and long-term point of attachment of a person to his work. A career intermingles the life history of the person with the jobs he holds in an employing organization (Hughes, 1958). A career gives the individual a vista along which he can reasonably expect to move at stated future times. But a career is also a set of related jobs provided by the employing organization. Thus, a career articulates a person's expectations about work with employment opportunities available in his employing organization. Where careers are shared among working colleagues, a bond of association grows up among them.

Essential to the existence of a career is a range of connected work-opportunities along which the career may unfold. This range is ordered from entrance jobs to terminal jobs through which the people attached to a career can normally expect to progress. Thus, a linkage-system among functionally related units that shows the general lines along which careers develop through promotions, power pay, and status pay (Dubin, 1958*a*) serves to define career complexes.

Where career stages are clearly defined by inter-unit moves (e.g., from supervision through middle management to top management), the most general effect is to introduce instability in the units among which personnel mobility occurs. People are constantly moved out of work units to which they have become habituated and in which they have developed mutual attachments with colleagues. Their jobs are filled by replacements who have to build new personal relations, often creating a period of tension for all concerned. The process is, of course, repeated for the original movers in the unit to which they move.

The compelling quality of career lies in the fact that, once its existence is recognized, those committed to it are constrained to move through its stages of development. It becomes unseemly to refuse an offered advancement even though the personal "costs" in disrupted human relations may outweigh the public recognition of worthiness signaled by the offered advancement. Indeed, failure to accept advancement to the next stage of a career may permanently mark a man as unmotivated, incompetent, lazy, or even disloyal in the eyes of his superiors and colleagues. Thus, the existence of work careers creates the attendant inter-unit mobility that results in pursuing them. This personnel mobility operates against work-unit stability.

Careers have a different impact on work-unit stability where the linkage-system of the organization mitigates against inter-unit mobility. This occurs most frequently because of the functional distinctiveness of the unit's operations. The division of labor specializes operations, often to the point where they are unique in the tasks involved in them. Departments or units such as purchasing, personnel, accounting, engineering, product development, time study, and the like, may involve such specialized tasks that accomplishment in them leads to "trained incapacity" for any others. Where career lines become flattened by specialization, three different results may develop, all of which have consequences for work-unit stability. Under such circumstances, there may be pressures to "professionalize" specialized work; there may be flight into other more attractive careers; or there may be a transformation of career from occupation to company. We will examine each of these in turn.

Individuals in a functionally unique operation may seek to expand the length of their flattened career lines through professionalization of their work (Foote, 1953). This is done by shifting to the colleague work group the determination of finer gradations of career stages corresponding to the more subtle differences among tasks within their operation. These subtle task differences are perceptible to participants, and largely beyond the ken of outsiders. Thus, private careers (Dubin, 1958*a*), unique to individual companies or organizations, develop within specialized operations.

The most general consequence of professionalization of careers is greater unit stability. This develops by focusing participant's attention on unit goals (as distinct from organization goals) particularly as their achievement affects careers within the unit (Merton, 1940; Selznick, 1949; Reissman, 1949; Blau, 1955; Francis and Stone, 1956; Dubin, 1951). There is a strengthening of attachment to the work unit because it (and not the whole organization) is the locus for the full unfolding of a specialized career.

A secondary consequence of professionalization of careers on work-unit stability is the fracturing of the unit into sub-groups each centering on the successive career stages within the specialized career area. Thus, a specialized unit within which professionalization is taking place may be subdivided into smaller social groups, each containing career-stage peers. A ready, but by no means the only example, is the pecking order of the sub-specialties in the personnel management field.

Another secondary consequence of professionalization of specialized operations is a shift in orientation from the organization to the profession as a whole (Reissman, 1949). Where a profession reaches the point of organization of an association to promote professional interests (and most administrative and management specialties do whether or not they are "true" professions), there may be an important shift in orientation away from the organization. This helps to legitimize the specialty and insulate its members against the temptations to move out with the hope of moving up. Thus, while the outward orientation may create problems of congruence between unit goals and organization goals, it nevertheless promotes within-unit stability.

The professionalization process may also work backwards if an organization unit is established around an already developed professionalized occupation. For example, the institution of a medical department in a company brings into the organization a series of related professionalized occupations with their established internal divisions of career stages. This reverse process of introducing an already established profession in the organization produces the same general consequences for unit stability as the evolution of professionalization within the organization.

Flight from an organization unit occurs where professionalization is insufficient to counter the flattening effects of specialization on career length. The linkage channels among units are clearly not promotion lines because the individual's contribution to the organization is uniquely related to his specialty. Viewed from the organization's standpoint, the specialist has a trained incapacity for anything but his present area of knowledge (Laski, 1930). From the individual's standpoint, however much he may succeed at his specialty, and however fine may be drawn the career steps within it, the desire for upward mobility is not satisfied. The literature contains examples of engineers in steel companies caught up in just such circumstances (Dalton, 1950). Their solution was flight into the line organization as a means for extended upward mobility.

The consequence of fleeing from a restricted career is the decrease in the stability of the unit from which moves are made. This results, first, because the movers, if successful, break the career-stage hierarchy, and thereby cast into doubt its adequacy for those who remain behind. Furthermore, the simple increase in personnel turnover attendant on the flight of career-jumpers works against developing well-established associations among members of the unit out of which they flee.

Making a career of the company is an alternative to centering careers on occupations. Where careers have very short lines of progression from bottom to top or where jobs are career-less, his occupation may be a minor focus of attachment for the individual (Dubin, 1958*a*). The employing organization becomes the significant unit of personal attachment (Dubin, 1958*a*; 1958*b*). This has the effect of reducing the strength of attachment of the individual to his particular work unit (excluding considerations of human-relations factors for the moment). On the other hand, making a career of the company tends to support system stability by committing employees to the search for continued employment in the organization *wherever* there is a place for their services. The company as a career insures a reservoir of employees who are constantly seeking to maximize their employment tenure up to the point of formal retirement.

Making a career of the company is further buttressed by an indifferent orientation among organization participants (Dubin, 1955; 1958*a*; 1958*c*). The essential criterion of an indifferent orientation is that the institution of participation is not central to the person's life interests. He participates because of the instrumental value of his payoffs for doing so. In another connection such a person has been labeled an "organization automaton" (Dubin, 1959). Such a person is oriented very narrowly to the technical or task aspects of his work and exhibits considerable malleability in accepting changes in his working environment so long as the changes do not materially affect his security payoffs for working. Consequently, such a worker may be relatively undisturbed by developments which change his working unit or his place in it. Work-unit stability is not an essential ingredient in his attachment to company or fellow workers.

We may now summarize the influences of careers on work-unit stability. When work becomes a career the primary effect is to stabilize work units. This stability is achieved, however, among sub-units composed of career-stage peers, and at the cost of orientation to professional colleagues, wherever found, rather than to the organization alone. One of the major costs to the organization is elaboration of sub-unit goals that may not be wholly compatible with organization goals. Where career lines are too short for "strivers," they may flee the career into other organization units with the resulting turnover which impairs the sense of career legitimacy for those who remain behind, and also disturbs the human associations within the work unit. Where careers are insignificant, or nonexistent, the employee may seek to maximize his employment opportunities in the company, being relatively indifferent to the particular work unit of his present assignment—another influence reducing work-unit stability.

We conclude that career aspects of working operate to increase unit stability under some circumstances, and reduce it under others. Recognition of the circumstances leading to unit stability or instability that flow from a person's view of his work as a career is an important condition for effective decision-making about organization problems. We will draw out some of these implications in the last section of this chapter.

Human associations and unit stability

In general, people working together tend to get together. Groups of peers and close associates in organizations typically develop out of continual interactions among people. The mutual attraction, sharing of norms, self-recognition as a group, and uniformity and cohesiveness in action come at a later stage when communality of interests are perceived and acted out.

There is considerable literature dealing with small groups in general (Cartwright and Zander, 1953; Hare, Borgatta and Bales, 1955), and with small groups in commercial and industrial organizations (Whyte, 1955; Sayles, 1958; Dubin, 1958*a*). Our concern here is with factors that tend to stabilize or unstabilize organization units. Consequently, we will assume general familiarity with the nature of small groups on the reader's part.

An organization unit may contain a small enough number of persons, so that it may become a voluntary social group (a voluntary group is one in which membership is self-chosen), all unit members being part of it. In such circumstances, the analysis of the voluntary social group is also the analysis of the organization unit. In general, this results where the unit is an "organized team" (Dubin, 1958*a*), so that the voluntary grouping of its members is likely to correspond to the membership of the team.

On the other hand, the organization unit may contain more employees than are typically included in a single voluntary social group. Within such a unit several social groups are likely to develop, whose very existence tends to fracture the whole work unit into smaller groupings of members. This result usually obtains where the work unit is a "task group" or a "technological group" (Dubin, 1958*a*). A general consequence of an organization unit being subdivided into several social groups among its members may be to reduce the stability of the unit as a whole. This typically is exhibited in competition or conflict among the social groups; neutrality of some towards the organization objectives of the entire unit; or elaboration of social-group goals that run at cross purposes to those of the whole unit. The size of the organization unit, and the grounds on which it is organized as a work group to get work done (Sayles, 1958), may both mitigate against total organization-unit stability by dividing the unit into several voluntary social groups.

We can briefly summarize the bonds of association among members of a voluntary social group in terms of the functions of the group for its members. A more extended analysis is presented elsewhere (Dubin, 1958*a*). These bonds of association among colleagues in voluntary social groups are the product of: (1) the way in which change and innovation are introduced in work routines; (2) the development of standards of group conduct; (3) the maintenance of individual personality-integrity; and (4) the structural basis of morale. We will discuss each in turn.

Changing work routines by following non-formal rather than the formally prescribed methods, or the innovation of work routines not previously discovered as usable, depends on the colleague work group for support. The very nature of these changes implies that they are neither sought by management (except in the instance of suggestion systems or their functional equivalent), nor do they necessarily contribute to the realization of organization goals (as, for example, in restriction of output). Consequently, the audience for such change and innovation is not management, but fellow workers. Furthermore, the fellow-worker audience is brought into play by the fact that actual working behavior is exposed to the view of working associates most of the time. It is difficult, if not impossible, to hide from fellow workers what one does on the job in the daily round of accomplishing it. Consequently, the mutual involvement of colleagues in one's task changes and innovations binds the society of close associates together for mutual support in approving such modifications of tasks, and even in a conspiratorial sense, when the modifications have to be protected from managerial detection. We conclude that the visibility of individual task modifications in the audience of fellow workers develops a bond between the innovator and those who can see what he does while working (Roethlisberger and Dickson, 1939; Whyte, 1948; Walker, 1957).

When a group develops some degree of self-awareness, at least by defining the boundary of its membership, conduct standards are developed to govern interpersonal relations. These conduct standards develop out of the environment of group activity. They may relate to moral criteria for behavior towards group members, the range of acceptable subjects of discourse (Magistretti, 1955), the degree of intimacy of association, and the ideology of the group (particularly its self-image and self-justification). These conduct standards define the conditions for continuing membership in the voluntary group. To be a member, and remain one, requires participating in the group consensus regarding acceptable behavior. The bond of consensus gives unity and cohesion to the group.

The integrity of an individual's personality is intimately bound up with the collective view that others take of him. The "significant others" (Mead, 1934) in the working environment include, but are not exclusively limited to, working associates. Fellow workers constitute an important audience of significant others who can differentiate personality idiosyncrasies from position characteristics, according acceptance and approval, or rejection and disdain, for them. The cog in the impersonal wheels-within-wheels of an organization retains his sense of personality wholeness and integrity because it is daily supported by interactions with peers. Even beyond this, a sense of worth about skills and abilities in task performance may also be a product of the approval and acclaim of fellow workers (Roethlisberger and Dickson, 1939; Walker, 1957). The individual is bound to his group associates as "significant others" who sustain his personality-integrity through their frequent interactions with him.

We can define morale as the zeal displayed for the accomplishment of a group goal. The context of such zeal is interpersonal relations. Enthusiasm for what the group wants to do is generated out of interaction among group members. It is also sustained by continual association while acting out the chosen courses of behavior (Shils, 1950, 1951). Thus, in the action phase of a group, the morale of its members turns out to be a product of constant association in the activity, and the mutual support for the individual's zeal that comes from it.

These four bonds uniting members with a group of close associates (the terrain can be, and has been, more extensively or differently plotted) serve to summarize the point of our central concern: that voluntary social groups among working colleagues have grounds for developing stable interaction patterns among participants. Voluntary social groups exist in work organizations, and they have their own special bases on which they are stabilized.

What threats are posed by the organization to the stability of voluntary social groups within it? We can suggest some very general answers that are sufficient to illustrate the existence of such threats. This, in turn, builds the analytical base for considering group defenses of its own threatened stability, discussed in the following section.

Over-specification of individual tasks, through detailed programming of them by the organization, may tend to suppress individual job changes and innovations. Over-specification of a task, for those performing it, implies a "best way" for carrying the task out that is organizationally determined and legitimized. An uncertainty may develop for the individual worker as to whether it is possible to make individual task changes. Even if made, there is the secondary uncertainty about the purposes to which the task changes will be put. An obvious solution to the second uncertainty is restriction of output to minimum acceptable levels, which usually takes considerable knowledge and subtle familiarity with a task to accomplish (Mathewson, 1931; Collins, Dalton and Roy, 1946; Roy, 1952). The resolution of these two uncertainties is usually sought within the society of close associates who reinforce the grounds for believing that task overspecification suppresses individual initiative, and who may encourage illegitimate uses of it.

An organization source of threat to group-conduct standards may be the imposition of shop rules governing personal relations. These shop rules may specify standards of honesty *vis à vis* the organization which, for example, if strictly enforced, would threaten fellow-worker consensus. For instance, a group may feel some degree of "requisitioning" of company materials for personal use is legitimate, or that ringing the time card of another worker is a justifiable expression of loyalty to him. If shop rules prohibit these practices, then the group members have a choice situation of displaying fidelity to the organization or loyalty to associates. The first choice may destroy group unity, the second enhancing it at the expense of the organization. In a gypsum company, for example, many instances of precisely this choice situation are documented for plant workers as well as gypsum miners (Gouldner, 1954).

Important pressures may be generated by the organization through training, example, and habituation to work regimes, to fit employees into the image of their jobs, positions, and offices. This is the now familiar picture of making "organization men" out of them (W. H. Whyte, 1956). Whyte's polemic is centrally concerned with the destruction of personality-integrity in the process. Insofar as employees do become organization men, their self-image may no longer reflect the images that working colleagues, as significant others, have of them. This, in turn, may loosen the bonds uniting the members of voluntary social groups, tending to unstabilize them. It is interesting to speculate that the organization-man demeanor may be worn by many as a thin veneer in the company of superiors, to be ridiculed, castigated, or ignored in the private society of close associates. Certainly, much of the humor about business conveys this impression (Mead, 1952). The underlying satirical theme in this humor also suggests that at least some people do turn into organization men, becoming outlanders to those who preserve their personality-integrity in the companionship of fellow workers.

Examples are legion of organization-initiated "morale" programs designed to improve the zeal of employees. Most of these programs are pure hokum in conception, content, and consequences. Insofar as any employees take them seriously, there may be generated a strain between looking to the organization for visible support of individual zeal, or finding such support in its natural habitat, the voluntary social group. The mere calling into question of the fellow-worker group as the source of support for enthusiasm, which an organization-oriented "morale" program attempts, may loosen the bonds within such group and, consequently, its stability.

We have illustrated typical organization threats to voluntary group stability with respect to the four bonds holding such groups together. This recital is intended only to provide examples of how voluntary group stability may be threatened from organization sources. We have yet to mention the most general threat—that of individual mobility. When a person changes jobs by promotion, transfer, or quitting, he breaks associational bonds with his former colleagues and has to establish others with his new working associates. This personnel attrition among the voluntary social groups at work is always disruptive of group stability. It could hardly be otherwise, since part of the group stability is grounded in the unique interactions among unique personalities.

Group defenses of stability

The reality of threats to the stability of work units, or the smaller voluntary social groups that compose them, brings us to a consideration of defenses against the threats. We will examine three generic types of defenses: cooperation, antagonism, and indifference.

It may be initially disturbing to have group cooperation viewed as a defense against threats coming from outside the group. We normally think of cooperation as an expression of "togetherness" in which smaller differences and groupings are subordinated to larger purposes.

In the circumstances where the cooperation is built upon bringing a group *as a whole* into a cooperative venture as an integral part, the group's view of its participation may rest on the belief that engaging in the joint venture will serve to preserve the group's stability and integrity. The group's perceived threat is that failure to join in the cooperative venture may exclude it from potential benefits to be derived, or may even diminish its present payoffs from the organization.

Consequently, to preserve its present organizational position and its internal stability, the group as a whole takes the road of cooperation with the organization.

For larger groups, the phenomenon of cooperation as a group defense is well illustrated in international relations (alliances, federations), in business relations (cartels, trusts, and sales-marketing agreements), in union-management relations (collective bargaining), and in political relations (log-rolling among special interest groups). For small social groups of the kind at the focus of our attention, the same phenomenon has been documented. In an automated production operation the work crew changed its defense from an initial antagonism to that of cooperation (Walker, 1957). A study of three hundred work groups led to their classification into four general types, two of which had relatively high internal unity, controlled spontaneous antagonistic outbursts among members relatively more effectively, and were given the highest relative standing as good workers by their managements. That is, these groups were viewed by management as relatively more tractable, and, therefore, more cooperative (Sayles, 1958). There is a lengthy series of studies that comes to the same general point: that smaller groups in organizations must be viewed analytically and realistically as organic wholes whose cooperation in the organization must be sought as a unit. This is another way of saying that a threat to group stability may evoke cooperation as one possible group response. (Roethlisberger and Dickson, 1939; Chamberlain, 1950; Jaques, 1952; Whyte, 1948, 1955).

Antagonism as a way of defending group stability has been studied extensively because it is such a ubiquitous phenomenon. We need not pause to explain or illustrate it.

Indifference as a group response has been curiously ignored by students of organization. This may be due, in part, to the fact that indifference of a group is relatively hard to detect in the behavior of its members, or by the usual survey instruments employed to reveal attitudes. Indifference may be expressed in two general forms: by ignoring a subject of general organization interest; or by focusing on subjects irrelevant to the organization.

Where a group ignores an organizational problem, it may do so on grounds that cooperation or antagonism on the part of the group will produce insufficient payoffs to be worth pursuing. Furthermore, the group may conclude that whatever the solutions others achieve to the problem, its own destiny will not be materially affected. The problem becomes "their" problem, and its solution is immaterial to group stability.

When a group focuses on subjects irrelevant to the organization, it may do so in order to avoid the organization issue, or simply because the time available for group discourse and action is limited, and choices have to be made. In either event, the refusal to be involved serves effectively to maintain group stability.

The indifferent response as a group defense is probably the most common one in organizations. This conclusion cannot be documented adequately because the literature of studies overwhelmingly illustrates group antagonism, occasionally celebrates cooperation, and seldom considers the indifferent response as a group defense. There are good reasons for concluding that defense by indifference is the most frequent group response in organizations (Dubin, 1955; 1958*a*), whose explication lies beyond the scope of this chapter. We must simply be satisfied with asserting the proposition as testable in future research.

The society of close associates, which makes up the personnel of organization units, has its own stabilizing mechanisms, and characteristic modes of response to threats against its stability. Some of the sources of group stability are to be found in the working-life history of individuals, while others derive from the processes of human sociability. The design of organization structures and the attack on organization problems must combine the linkage problem among organization units with the intra-unit features of human association as the twin analytical features from which solutions can be generated.

Strategies of Decision on Organization Problems

There now remains the task of putting this analysis together from the standpoint of organization decisions. We will proceed by presenting and discussing some interesting organization problems within the framework previously outlined. This discussion by no means exhausts the range of typical organization problems, nor does it even attempt to be a systematic sampling of them. The purpose is to illustrate the usefulness of the preceding analysis.

Staffing and individual mobility

The normal attrition of personnel throughout an organization sensitizes management to the problem of replacements. The most typical answer to this problem is the designation of career ladders accompanied by training programs for preparing the movers for their next position. The training problem for production workers who move is usually handled after the move, as an immediate prelude to taking the new job. In the instance of management personnel, however, the more typical pattern is to provide at least some training to potential movers well before they actually move.

In order to carry out pre-move training, it is necessary to designate the employees selected for potential advancement. This has the effect of marking them as "fair-haired boys" among working colleagues, well in advance of their leaving the colleague group. Thus, the pre-move training answer to the problem of keeping the organization personnel pipe lines (career linkage-systems) filled with replacements may be unstabilizing for individual work units.

Peer relations in a voluntary social group are destroyed when one of its members achieves special distinction not accorded by the group itself. The group is also disrupted if, as a consequence of such distinction, the individual will clearly cease being a member at some foreseeable time in the future.

The situation is further complicated by the methods used in pre-move training. Where the training is carried out while the individual is on leave from work (at a centralized company training center, or at a special university-sponsored resident training-program for executives) the effects on social group stability may be minimized. Being on leave from the job provides the natural break in sociability bonds that absence from the group entails. On the other hand, where training is carried on concurrently with job performance, the break with the colleague group may be more equivocal. This becomes particularly crucial where specialization and "flattening" of careers leads to the designation of a "second man" who will come out of the ranks to supervise his former colleagues when the boss' position is vacated. The "second man" has genuine marginality to his working associates as well as the colleague group of which his boss is a part.

A strategy in handling the mobility-training problem for management-level personnel is to weigh the costs of training-while-working against the costs of leave-of-absence training. The costs in the former case are those associated with unstabilizing work groups, and the probable defensive responses they may exhibit. At the same time the training-while-working direct cash costs may be relatively small. Leave-of-absence training tends to be expensive in dollars (salaries of trainees, their replacements, trainers, living expenses, and operating costs of training center), but less disruptive of work groups. Depending on the selection of criteria, choices can be made among the alternative outcomes different training programs produce.

Key units

In any organization system certain units occupy a crucial function. The cruciality of the function is the fact that it serves as a point of articulation among units.

Whole units are crucial when they control, coordinate, direct, or innovate for other units. One question of organization design then turns on the choice of the most effective linkage-systems between crucial units and others. The choice problem is different depending on the function performed by the key unit.

Where one unit directs others, the connection should be immediate and unequivocal. This rules out a circular linkage-system which is equivocal precisely because no single unit is dominant. The choice then rests between a serial or a radial system. A vertical-serial system with the crucial unit at the top would generally be preferred, where the whole complex directed by the crucial unit represents a specialization by purpose. Such a linkage-system maintains the unity of the purpose-specialization, and therefore the stability of its operations. Furthermore, the articulation with other purpose-specializations in the organization is centered in the crucial directing unit, and not dispersed among the subordinate units. This limits number of linkages flowing from inside the purpose-specialization to coordinate specializations outside.

The direction problem may be solved in favor of a radial linkage-system where the subordinate units are stages in a process-specialization. The radial focus becomes the directing unit of a horizontal-serial composed of units between which work flows in process. The radial focus unit articulates the process with the larger organization. At the same time, the radial linkage with each unit in the work-flow process provides equal and coordinate access to all by the directing unit.

Where the problem is that of coordination of subordinate units, the choice among linkage-systems is clearly between a radial or a circular system. In general, the coordination of several purpose-specializations leads to the choice of a circular system of linkage among them. We have already noted that no single unit dominates a circular system. Purpose-specialization in an organization is based on a broad division of labor, none of whose subdivisions has greater priority or dominance in the resulting web of interdependence. Consequently, a linkage-system that minimizes the possibility of any single specialization gaining dominance is to be preferred, i.e., a circular linkage-system.

Where coordination is among units specialized by process, a radial linkage-system may be preferred. The argument in favor of this choice is essentially similar to the selection of this linkage-system when process-specialized units are directed.

The control of units, as in budget control, quality control, production control, and the like, usually is structured on the assumption that the aspect of organization behavior being controlled is itself a purpose-specialization. Consequently, control units tend to have a maximum number of total organization-linkages, because they ,are connected to every relevant unit exhibiting the behavior to be controlled. In addition, the control unit is dominant over all other units in the subject it controls. These considerations rule out both a circular linkage-system, and a serial one. Control units are a radial focus in a radial linkage-system.

The problems of career lines and authority lines may become acute where the control unit has its own personnel attached to operating units. This happens particularly in budget and quality control. For example, inspectors are often members of the quality-control unit but operate in the production departments. Their authority may exceed that of production supervisors in halting operations whose products exceed inspection tolerances. Inspectors also look to their home unit as the locus of careers, but at the same time are daily exposed to the opportunities and advantages of alternate careers in the units whose work they inspect. Their superior authority may tend to confirm the selection of inspection careers, but this may be mediated by their daily observations of alternative careers with their own special attractions. The same order of problems involving careers and authority appears in organization decentralization, where central office units maintain members in local plants and offices.

In general, control units have maximum linkages with operating units that are in addition to the linkage-systems necessary to direct and coordinate them. The linkages for control purposes always complicate the systems necessary for straight operations. The use of a radial system for control purposes serves the control function efficiently, but always has a compounding consequence for the organization system as a whole.

The innovating function for organizations usually has to satisfy two functional requisites: that innovators be minimally committed to present organization practices; and that they have maximum access to the larger environment from which new ideas may be drawn. These conditions are usually met by specializing such departments as research and development, product design, forecasting, and the like, and *segregating* them from the mainstreams of the organization. The most efficient linkage-system for segregating a unit is a serial one, requiring at the minimum only one link with some other unit of the organization. It is through this link that the innovating suggestions are passed on to the organization, and through which organization support flows back to the innovators. A serious problem for members of innovating units is that of careers, which is usually solved through professionalization with its typical consequences of divergent unit goals, insulation from other careers, and orientation away from the organization towards professional colleagues wherever found. The functional requisites for innovation in organizations so outweigh the costs of professionalization that linkage-systems permitting stronger ties with the organization than a serial link are inappropriate for innovating units.

A minor variant of the segregation effect occurs, where units become obsolete, and considerations of management *noblesse oblige* mitigate against their total abandonment. The unit may be segregated from the organization by confining it to a serial linkage, and permitted eventually to die through attrition among its remaining personnel. The individual analog of segregation by using a serial linkage is the familiar "kicking upstairs" of a superfluous person.

We have briefly indicated that there are clear strategic choices among various linkage-systems in fulfilling different organization functions. These choices are related to particular functions. It is furthermore clear that in fulfilling all functions the organization as a whole will display the full range of the generic linkage-systems. This is why any single organization chart is a lie, for it can never simultaneously display the full array of linkages among units. This also suggests that the arbitrary imposition of a single linkage-system as "the" one for an organization may be highly dysfunctional to its operations.

Monitoring effect

The monitoring effect in organizations is directly related to our previous discussion of "stimuli saturation." It was pointed out that simultaneous cues coming through various links to a unit may reach such volume that their clear reception is impaired, or operating conditions make effective response to all impossible. In the immediately preceding section we have sketched out some of the variety of such cues that flow into an organization unit.

One way of solving the stimuli-saturation problem is to have one unit act as a monitor of cues received from outside the purpose or process specialty. All demands for action (e.g., orders, services, requests for information, etc.) filter through the monitor unit before being passed on to subsequent units. It becomes the responsibility of the monitoring unit to order the demands for action by some priority criteria (timing, relevance, importance) before sending them on to be acted out. The monitoring unit may also become the organization point through which the subsidiary units respond to the demands for action.

The consequence of having a monitoring unit is that it relieves all subsidiary units from establishing their own priority criteria among the demands for action received. This is clearly a gain in efficiency in terms of reduced unit work load, the probable minimization of stimuli loss, and greater uniformity of priority criteria in sorting demands for action. Furthermore, where the monitoring unit is also the point of transmission back to the organization of responses to action demands, there is the added efficiency gain of having a single location for responsibility.

The monitoring effect is usually associated with direction and/or coordination. In the "perfect" division of labor we can conceive of the "withering away" of the direction and coordination functions. If each unit does exactly what it is programmed to do, and the total program of operations is "perfect," then coordination and direction become superfluous. At least in theory this can happen. But we would still be constrained to recognize the monitoring effect as an irreducible residual function to be performed because of the inherent limitation of human actors with respect to their stimuli-saturation. We might speculate, therefore, that middle management will always have a monitoring function to perform, and might even direct research attention to discovering the degree to which this function now occupies middle managers.

Directionality of action

Up to this point we have generally ignored the directionality of action as an organization-linkage problem. We now turn attention to this issue.

For purposes of illustration, we will contrast a control and a service department. Both are most efficiently linked to organization units as radial focus units for them. We have already pointed out that a control department initiates action to which organization units respond. For service departments the direction of initiation is exactly reversed. In the typical situation the organization unit initiates a request for service to the service unit.

From this contrast it is clear that the directionality of action makes a great deal of difference in the number of linkages being used, even in an identical linkage-system. When a control department is "controlling," it simultaneously activates all its links with organization units. The whole radial net is in operation at the same time, and the volume of simultaneous cues in the whole system is equal to the number of links radiating from the control department. On the other hand, when a service department is "servicing," it is doing so in response to a limited number of requests simultaneously activated by a few among all the units to which it is linked. The volume of simultaneous requests for service is always materially less than the number of existing links radiating from the service department.

Thus, two identical linkage-systems may have significantly different volumes of linking activities, depending on the direction of flow in initiating action. Furthermore, two units having identical number and kind of total linkages with the organization may have quite different volumes of linking activities, depending on whether they are recipients of action initiated elsewhere, or originators of it.

The directionality of action also has consequences for unit stability. A unit primarily the recipient of cues for action, will characteristically display antagonistic or indifferent defenses in circumstances where the cues are individually or collectively threatening. Solidarity among group members may be strong, but negatively oriented toward other organization units initiating action. A unit primarily the originator of cues for action, on the other hand, may be oriented toward demanding cooperation from recipient units, enhancing their tendency toward negative response. The internal solidarity of a unit predominantly originating organization action usually centers on members' self-images of essentiality and centrality to the organization.

Equivocation in authority and status assignment

In some situations it is not feasible to make distinctive assignments to organization units of authority or status. This may arise because the organization is undergoing rapid change, or because the differences of authority or status may be relatively small so as to make any objective differentiation difficult. Under such circumstances a radial or serial linkage-system among these units might appear to their members as an arbitrary, unrealistic, or even false assignment of authority or status.

The most effective solution for such a problem is temporarily to link the units in a circular system. This has the effect of minimizing the possibility of initial dominance by any single unit. Furthermore, it provides an arena within which coalitions among units, leadership or dominance by one, or a self-initiated division of authority and status may develop. The general effect is to permit the units themselves (or their representatives) to develop an organization structure at least minimally satisfying to all. This is, of course, the typical procedure followed when top management involves organization units in policy decisions through representative advisory committees (Chamberlain, 1950).

The "togetherness" syndrome

The group-dynamics movement has had considerable impact on the behavior of organization managers. Insofar as the precepts of group dynamics have affected the behavior of individual managers toward individual employees, the net effect is probably extremely worthwhile in terms of democratic values and psychic comfort for managers and subordinates alike.

An interesting perversion of the group-dynamics precept occurs, however, when units of an organization are literally viewed as though they were individuals. The basic interaction pattern among individual persons, preferred above all others by the group-dynamics philosophy, is a circular system of linkage. This makes peers of all participants. And that is the goal of the group-dynamics philosophy.

At the level of linking organization units, the analogical application of the group-dynamics precept leads to a preference for circular linkage-systems. This takes the typical form of permanent committees made up of unit representatives, *ad hoc* committees, periodic meetings of representatives of "interested" units, or the persistent demand that everybody be "kept informed" of developments in each unit. The volume of activities involved in this togetherness, as well as the gamesmanship employed to carry it through, is what has given rise to Parkinson's Law, and parallel, but less exact formulations of it.

There is serious question whether the linkages among organization units is really an analog of linkages among individual persons. A person is a self-contained whole, however much the personality may be dependent on interactions with other persons. A unit of an organization, on the other hand, is a specialized portion of a division of labor. It is not a self-contained whole. Its meaning, purposes, and activities are defined by interdependence with other units. The linkage among dependent units is given by the ways in which their specialized functions mesh with each other.

Perhaps the analog of the human body as a physiological system is a more appropriate way to view an organization. The nerve endings, brain, and hand do not hold a conference to reach a consensus that scratching an itch is desirable. Neither is this kind of peer-determined consensus necessary to link specialized organization units in coordinate action.

We have already indicated some circumstances where a circular linkage-system among units is an effective solution to organization problems. The list could undoubtedly be extended. There is not reason to believe, however, that a circular system can be made the basic pattern for unit linkage. Indeed, theory and evidence would condemn it as inefficient and problem-generating more often than not.

Conclusion

We have examined some organization problems from the standpoint of the analytical framework first presented. Our interest has been in decision-making about organization matters that involve the units into which organizations are subdivided. In order to establish criteria for decision we have first had to examine the grounds on which systems of units and individual units are stabilized. The specific problems of decision examined do not purport to be a systematic sampling. They were selected because they illustrate the potential usefulness of the analytical framework in understanding behavior of people in organizations.

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DORWIN CARTWRIGHT

9.

The Potential Contribution of Graph Theory to Organization Theory

Introduction

THE PURPOSES OF THIS PAPER ARE: (1) TO SUGGEST THAT THE MATHEMATICAL theory of linear graphs can be of considerable help to the organization theorist; (2) to illustrate some of the ways in which such help might be achieved; and (3) to refer to publications of special relevance for those who wish to explore this possibility further.

Theorists concerned with the structural properties of organizations often make use of two basic ideas, which serve formally as primitive

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The theoretical possibilities described in this paper have gradually become evident as a result of an extended collaboration between social scientists and mathematicians in the Research Center for Group Dynamics. I am especially indebted to Frank Harary for many of the ideas proposed here, and refer the reader to a paper of his on a similar topic (Harary, 1959*b*).

(undefined) terms in that the more complex conceptions of the theory are built up from these terms. Although given various labels in different theories, these two terms refer essentially to (1) units or parts of an organization, and (2) relationships or connections between pairs of units.

Organization theorists differ in what they take to be the basic unit. For some, the organizational building block is the individual person. For others, it is the office, position, or role. And sometimes it is a particular collection of people, such as a work group, section, or department. Whatever the parts of an organization are said to be, in analyzing structural properties the basic unit is treated as an undifferentiated entity.

The units of an organization are said, depending upon the particular theory, to be related by bonds, linkages, channels, connections, or lines—to mention but a few of the labels employed. These different labels reflect, to some degree, the *type* of relationship selected for emphasis, although most theorists allow for several different types to exist between any given pair of units. Those of most common interest appear to be: authority or power; responsibility; communication; task or work interdependence; goal or motivational interdependence; attraction or loyalty; and interaction or association.

Statements about the *structure* of an organization (e.g., that it is hierarchical, that it has many levels, or that it is decentralized) refer essentially to the arrangement of its units and relations. The typical organization chart, by identifying certain units and indicating the authority relations intended to obtain between them, depicts one aspect of the organization's structure. Other aspects could be shown by indicating communication networks, patterns of friendship or association (commonly referred to as the "sociometric structure"), and the flow of work. In all these treatments of structure the organization is conceived as consisting of some configuration of interrelated units.

The branch of mathematics known as the theory of linear graphs, or more simply as graph theory, is concerned with the "patterns" or "configurations" of collections of abstract elements called "points" and "lines." The potential usefulness of graph theory for the organization theorist lies in the possibility of coordinating units of an organization to points of a graph, and relationships between units to the lines of a graph. If such a coordination could be properly carried out, then the formal properties of graphs could be said to apply to the structure of organizations.

The gains to the organization theorist from such a coordination would be considerable. A simple, but by no means unimportant advantage derives from the fact that graph theory provides a means for depicting structural properties, thus making it possible to "draw a picture" of an organization. The heuristic value of being able to "see" the structure of an organization should not be underestimated. Of much greater importance, however, is the fact that graph theory constitutes a *mathematical system* consisting of undefined terms, axioms, and theorems derived from these. If certain conditions are met, graph theory can serve as a mathematical model of the structure of organizations. Then organization theory would be able to employ the conceptual rigor of the mathematical system, and the results of years of mathematical work.

The mathematical work on graph theory has produced three major kinds of results of potential value to organization theorists. First, graph theory contains certain "higher-order" concepts which are rigorously defined in terms of the mathematical system. Since these terms refer to more complex properties of graphs, the coordination of graphs to organizations would provide a set of precisely defined concepts for describing various properties of organizations. Graph theory would thus contribute to the "language" of organization theory. Second, graph theory supplies valuable techniques of computation, and formulas for calculating certain quantitative features of organization structure. Third, the theorems of graph theory specify features of graphs, and thus of organizational structure, which follow necessarily from the undefined terms and axioms of graph theory. It is important, in this connection, to note one limitation on these theorems. Since the axioms of graph theory state nothing about empirical tendencies (e.g., tendencies toward "preferred" states, or tendencies to maximize or to minimize certain properties), the theorems of graph theory, *per se*, cannot generate theorems about the dynamics of organizations. Graph theory, therefore, may be incorporated as a part of organization theory, but it cannot constitute all of it. A complete theory of organizations will contain empirical axioms in addition to those formal axioms provided by graph theory.

Ordinary Graphs

The potential usefulness of graph theory may be illustrated more specifically by means of a brief discussion of some of the basic concepts of graph theory. First, however, we must note that several different kinds of graphs have been distinguished. For simplicity,

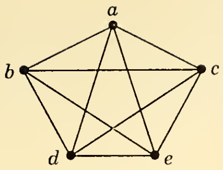

Figure 1

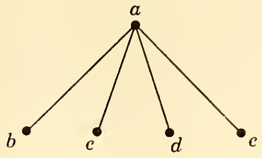

Figure 2

the discussion will be confined initially to what are known as "ordinary" graphs. Later, we shall indicate how other kinds of graphs might be more appropriate in dealing with certain kinds of organizational properties. For a more extended discussion of graph theory, the reader is referred to Berge (1958), Koenig (1936), Harary and Norman (1953; to be published), and Harary, Norman, and Cartwright (to be published).

A graph of n points consists of these n points together with a subset of the set of all lines joining pairs of these points. A graph is said to be *complete* if every pair of its points is joined by a line. Figure 1 shows a complete graph of five points. Figure 2 shows a graph of five points which is not complete.

The following list of properties, which may be stated more formally as axioms, serve to characterize ordinary graphs.

1. A graph has a finite number of points.
2. Each line is a set consisting of two points.
3. Each line must join two different points. Thus a graph may not contain any loops, i.e., any lines from a point to itself.
4. A graph may have at most one line joining the same pair of points.
5. No distinction is made between the "initial" and the "terminal" point of a line. If a line goes from point a to point b, then the same line is said to go from point b to point a.

If we are to coordinate an ordinary graph to the structure of an organization, we must be able to identify each unit of the organization with a point of the graph, we must identify each relationship with a line, and the five statements above about the properties of ordinary graphs must remain true statements when "organization" is substituted for "graph," "unit" for "point," and "relationship" for "line."

The experimental work initiated by Bavelas (1948; 1953) illustrates how graph theory may be related to empirical phenomena. In these studies, communication networks were created so as to have various structural properties. Here, individual people were made to correspond to points of a graph, and "permissible" communication links to lines. The axioms of ordinary graphs were satisfied in most of these studies, although interesting modifications were introduced in some (e.g., Heise and Miller, 1951).

Some higher-order concepts

A *path* is a collection of lines of the form *ab, bc, . . . , de* where all the points *a, b, c, . . . , d, e* are different from each other.

A graph is *connected* if there exists a path between every pair of its points.

The *length of a path* is the number of lines in it.

The *distance between two points* of a connected graph is the length of any shortest path joining them.

The *associated number* of a point of a connected graph is the maximum of the distances from this point to each of the other points.

A *central point* of a connected graph is a point whose associated number is a minimum.

The *diameter* of a connected graph is the maximum of the distances between any two of its points; in other words, it is the maximum associated number.

We may now illustrate these concepts and show how they might apply to properties of an organization. Consider an extremely small organization consisting of five units, *a*, *b*, *c*, *d*, and *e*, and the officially approved communication channels among these units. Such a network of approved communication may be represented by an ordinary graph, if each unit is identified with a point and each approved communication channel with a line, and if the axioms of ordinary graphs produce true statements about the organization. The first two statements—that the organization has a finite number of units, and that each channel connects two units—present no difficulty. The remaining three statements raise interesting questions, and there are undoubtedly communication networks which do not satisfy them. It may be assumed, however, that in our hypothetical organization all are true; no unit has an approved communication channel from itself to itself; no more than one channel exists between any pair of units; and each channel is two-way.

Figure 3 represents one of the many possible networks which might exist in this hypothetical organization. Units *b* and *d* might belong to one department; units *c* and *e* might belong to a different department; and units *a*, *b*, and *c* might form a coordinating group.

This communication network is obviously not complete since not every pair of units is connected directly by a channel; for example,

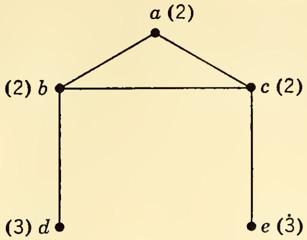

Figure 3

d and e cannot communicate directly. Brief inspection will reveal, however, that there does exist a path between each pair of units, indicating that the organization is connected; a message can go from any unit to any other via approved channels. If we look specifically at units d and e, we find two paths between them: (db, bc, ce) and (db, ba, ac, ce). The first path is of length 3, the second of length 4. The distance between d and e is therefore 3. It can be readily seen that the distance between d and any other unit is less than 3, making the associated number of unit d equal to 3. The associated number of each unit is shown in parentheses in Figure 3. Inspection of these numbers reveals that the communication network has three central points: a, b, and c. A message can reach every unit of the network from any one of these central units in no more than two steps. Finally, we note that the diameter of this network is 3; the greatest number of steps required for a message to go from any unit to any other is 3.

If the units of an organization are connected by a complete network, as in Figure 1, the values enumerated in the above paragraph will be quite different. Since each pair of units is now connected by a channel, the distance between every pair of units is 1, the associated number of each unit is 1, every unit is a central unit, and the diameter of the network is 1. The reader can readily calculate the corresponding values for the network shown in Figure 2, and for any other network which he may wish to construct.

Let us consider now a few more higher-order concepts of graph theory which may have significance for organization theory.

An *inner point* of a graph H, which is a subgraph of a graph G, is a point whose distance from a point of G not in H is maximal. An *outer point* of a graph H, which is a subgraph of a graph G, is a point whose distance from a point of G not in H is minimal.

Figure 4 may illustrate inner and outer points. We denote graph G as the set of points a, b, c, d, e, and x. We let graph H (the points

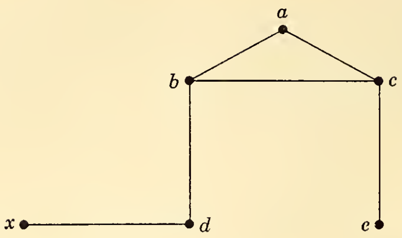

Figure 4

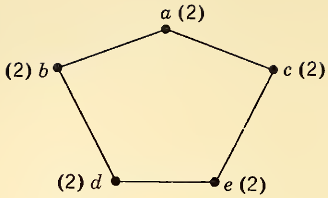

Figure 5

which were called "the organization" above) consist of points *a*, *b*, *c*, *d*, and *e*. It can be seen readily that the distance between *x* and *e* is 4, and that point *e* has the greatest distance from *x* of any points. The unit represented by point *e* is therefore the inner unit of the organization. Obviously, unit *d* is the outer unit since it is the only one having a distance of 1 from *x*. Unit *x* might be a supplier and unit *d* might be a purchasing section of the organization. It should be noted that an inner unit need not be a central unit, although it is possible for a unit to be both central and inner. An interesting empirical question to ask is, what difference it makes to an organization when units with various associated numbers have various distances from the "outside."

A *cycle* of a graph is a collection of lines of the form *pa*, *ab*, . . . , *cp* where all the points *p*, *a*, *b*, . . . , *c* are different from each other.

A *tree* is a connected graph which has no cycles.

In Figures 3 and 4 units *a*, *b*, and *c* lie on the cycle (*ac*, *cb*, *ba*). A network in which all units lie on a single cycle is shown in Figure 5.

The network depicted in Figure 6 differs from that of Figure 5 in that no channel directly connects units *d* and *e*. The absence of this channel "breaks" the cycle, converting the structure into a tree. It can be seen readily that the graph in Figure 2, which resembles the traditional organization chart, is also a tree.

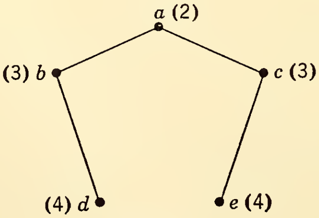

Figure 6

A comparison of the associated numbers shown in Figures 5 and 6 reveals that the existence of a cycle can greatly affect the centrality of units. In Figure 5 all units are central; in Figure 6 only unit *a* is central. This unit would seem to be in a quite different situation in the two structures. A theorem of graph theory states that any tree has either one or two central points.

An *articulation point* (sometimes called a *cut point*) of a connected graph is a point whose removal separates the graph into two or more subgraphs which are not connected to one another.

The possibility that people who serve as "liaison persons" may be treated as articulation points of a graph has been suggested by Weiss (1952), Jacobson and Seashore (1951), and Ross and Harary (1955). In Figure 3, units *b* and *c* are articulation points, and it was suggested above that these units might function as representatives of their departments in the coordinating group made up of units *a*, *b*, and *c*.

Articulation points have several properties of interest to the organization theorist. Since the removal of an articulation point separates the graph into two or more unconnected subgraphs, units which correspond to articulation points are particularly important in preserving the unity of the organization. It follows that an organization is most vulnerable at these points; the absence or malfunctioning of an articulation unit will have widespread repercussions for the organization. With this conclusion in mind, it is interesting to note that every point of a tree which is not an end-point is an articulation point, and that the traditional organization chart is a tree. The high vulnerability of these structures may account for the frequently reported existence of "informal" or "unapproved" communication channels in such organizations.

Units which correspond to articulation points of a communication network are likely to carry a heavy load of communication, because certain pairs of units of the organization cannot communicate to each other except through this unit. If such a unit becomes a "bottleneck" or if it systematically screens out certain types of information, parts of the organization will become poorly informed about matters that may be of importance to the organization as a whole.

There remains one higher-order concept to be discussed. The *degree of a point* of a graph is the number of lines of the graph on which it lies. In the type of coordination under consideration, the degree of a unit of an organization is the number of its approved communication channels. The higher the degree of a unit, the larger the number of units from which it may receive and to which it may send approved communication directly.

One might think that a unit with a large number of communication channels would have a heavy load or be especially important in some way. In certain respects this is true. If a unit is unrestricted in how to use its communication channels, it then has more discretion the higher its degree, and it can thus exert more influence on the direction of the flow of messages in the organization. Also, if circumstances arise so that a unit receives messages simultaneously over all its channels, it will obviously be busier the higher its degree. However, any correct general statement would be very complex, for the degree of a point of a graph is not related in any simple way to other structural properties of graphs which themselves clearly influence the importance or load of a unit. For example, the degree of an articulation point can assume many different values: unit *a* is an articulation point with degree 4 in Figure 2, an articulation point with degree 2 in Figure 6, and not an articulation point in Figure 5 even though it has exactly the same communication channels as in Figure 6. Similarly, the degree and the associated number of a point may vary independently over a considerable range of values. Thus, a central point may have a relatively high or a relatively low degree: in both Figures 2 and 3 unit *a* is central, but it has degree 4 in one and degree 2 in the other.

We may conclude, then, that the degree of each unit of an organization has some important consequences but that these consequences can be greatly modified by other structural properties of the organization.

Number of points and number of lines of a graph

In theorizing about the structure of organizations, many interesting questions can be raised concerning relations between the number of units and the number of connections in an organization. As the number of units increases, how many connections must be added to keep the organization a complete network? For any given number of units, what is the minimal number of connections required to produce a connected network? What is the optimal number of connections for an organization of a given size? Graph theory can help answer questions like these by providing information concerning necessary relations between the number of points and lines of a graph. We next consider a few formulas which express these relations.

First, it may be noted that the number of lines in a graph is obviously related to the degree of the points of the graph. Since every line contains exactly two points and thus contributes to the degree of two points, the *number of lines in a graph* is equal to one-half of the sum of the degrees of all points in the graph. Thus, whenever the degree of each point is known, the total number of lines in the graph can be calculated readily. The number shown beside each point in Figure 7 indicates the degree of the point. In graphs as simple as these it is easier to count the number of lines than to calculate this number from the degrees of the points. Under some conditions, however, the number of lines can more easily be calculated than counted.

Complete graphs. Knowing this simple relation between the sum of the degrees of the points and the number of lines of a graph makes it easy to see a necessary relation between the number of points and lines of any complete graph. In Figure 7 all the graphs are complete. It is evident that all points in each complete graph have the same degree. Specifically, the degree of each point of a complete graph is equal to the number of points in the graph minus one. From this fact, we can construct a formula for the *number of lines in a complete graph:* $L = \frac{1}{2}P(P - 1)$, where L is the number of lines and P is the number of points.

Planar graphs. Organization theorists will find that they are often dealing with a class of graphs known as planar graphs. It will be helpful, therefore, to know that certain formulas are available which state the relation between the number of points and lines of such graphs.

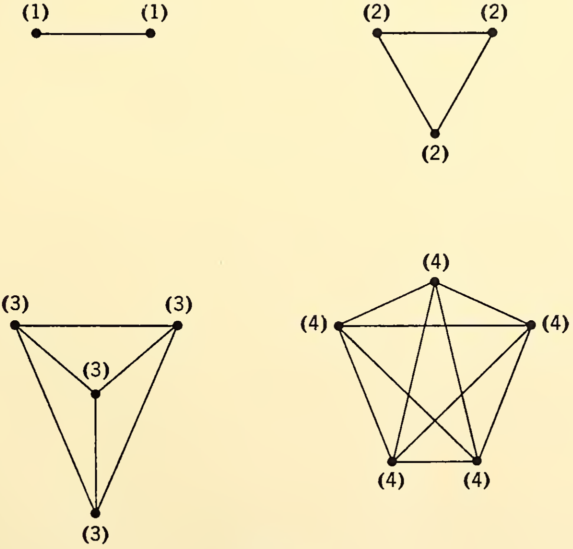

Figure 7

A *planar graph* is one which can be drawn on a plane in such a way that none of its lines cross. The graphs in Figure 7 which contain 2, 3, or 4 points are planar; the graph with 5 points is not planar. When a connected planar graph is drawn on a plane so that none of its lines do cross, we have a planar map whose vertices are the points of the graph, whose edges are the lines of the graph, and whose faces are areas completely closed by lines of the graph. It is known that for planar maps the number of edges equals the number of vertices plus the number of faces minus one. From this property of planar maps one can state the following formula for the *number of lines in a connected planar graph:* $L = P + F - 1$, where L is the number of lines, P is the number of points, and F is the number of faces.

It will be recalled that a tree is a connected graph which has no cycles. Thus, every tree is a connected planar graph whose corresponding planar map contains no faces. It follows that the formula for the *number of lines in a tree* is: $L = P - 1$. Figure 8 shows several planar graphs with their corresponding formulas. The last two graphs of Figure 8 are trees.

Maximal and minimal number of lines. It is immediately apparent that a complete graph has the greatest number of lines possible for any graph. Thus, the *maximal number of lines of a graph* is given by the formula $L = \frac{1}{2}P(P - 1)$. The minimal number of lines is obviously zero. A more interesting problem, however, is to determine the minimal number of lines of a connected graph. A little thought will reveal that such a graph will be planar, since any nonplanar graph can be made planar by removing some of its lines. From the formulas given above it is clear that a tree will have fewer lines than any other connected planar graph with the same number of points. Thus, the *minimal number of lines of a connected graph* is given by the formula: $L = P - 1$.

Optimal number of lines. What is the optimal number of lines for a graph with a given number of points? Obviously, the answer to this question requires selection of one or more criteria of evaluation. There would appear to be a very large number of possible criteria and a much larger number of possible combinations of criteria. For this reason, one cannot hope to find a single, universal value for the optimal number of lines. We shall, therefore, merely illustrate here a few ways in which questions of optimization might be approached.

In dealing with communication networks, it might be assumed that each channel is costly and that an organization should provide as few channels as possible. It might be assumed in addition that the com-

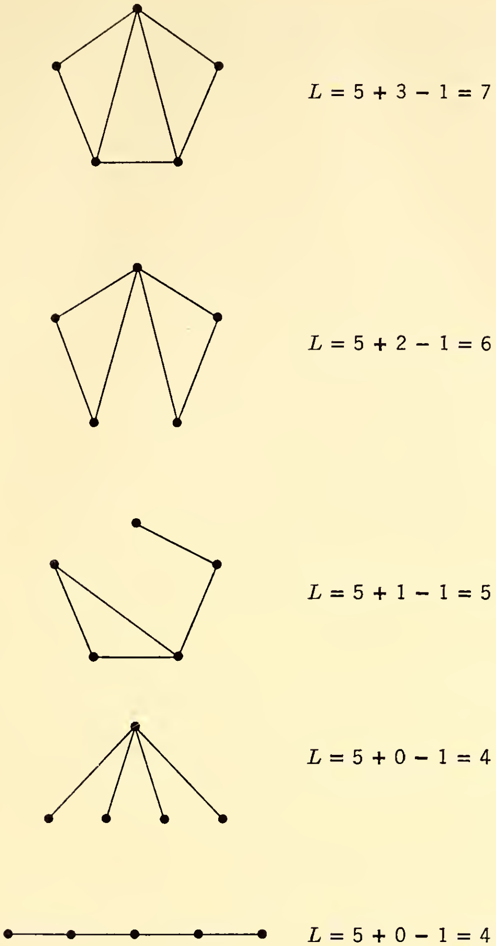

Figure 8

munication network should make it possible for a message originating anywhere in the organization to reach every other unit; in other words, the network should contain all units of the organization and correspond to a connected graph. We saw above that a tree meets these two conditions and that the optimal number of lines for these conditions is given by the formula: $L = P - 1$.

One might, however, be dissatisfied with this result, since a tree has certain properties which make it less than the ideal communication network in several respects. For example, as noted earlier, all points of a tree which are not end-points are articulation points. Since articulation points make a structure vulnerable and since they are likely to be subjected to heavy loads, one might wish to add another criterion, that the organization should not contain any articulation units. A graph whose points all lie on a single cycle satisfies this new criterion in addition to the previous ones. Such a graph is connected and has no articulation points. The formula for this kind of graph is $L = P$. But a graph of this sort will tend to have a large diameter. One might, therefore, want to add another criterion, that the diameter should not exceed some specific value. Again, an optimal value could be found, but it will be readily seen that the addition of criteria makes the solution increasingly difficult, and we shall not attempt here to pursue the problem further.

We conclude this discussion of the optimal number of lines with a general observation. The criteria which one will want to choose for evaluating a graph will undoubtedly depend upon the type of empirical relationship being considered. Throughout this paper we have employed communication networks among units of an organization to illustrate the usefulness of graph theory. Had we employed affective bonds between individuals, for instance, the suggested criteria of evaluation might have been quite different. With such a coordination in mind, it might seem that the optimal condition would be one which maximizes the number of lines in some way. Whatever the appropriate criteria may be in any particular situation, graph theory can be a useful tool in solving problems of optimization.

Some Limitations of Ordinary Graphs

At the beginning of this paper it was pointed out that graph theory can serve as a mathematical model of organizational structure provided certain conditions are met. Specifically, it is necessary to have an unambiguous rule for coordinating the points and lines of a graph to particular features (entities and relationships) of an organization. Furthermore, under such a coordination the axioms of graph theory must produce true statements when empirical terms are substituted for their coordinate graph theoretic terms.

In order to illustrate the potential usefulness of graph theory as simply as possible the discussion has been limited to the theory of ordinary graphs, although other kinds of graphs could have been chosen. Theories of different kinds of graphs differ from one another with respect to the set of axioms assumed. Each axiom system generates a particular kind of graph with an appropriate set of higher-order concepts and theorems. It is not possible here to present the theory of other than ordinary graphs, but we must discuss at least briefly some alternative axioms which may prove to be of great importance to organization theory.

Symmetry of lines

One axiom of ordinary graphs asserts that no distinction is to be made between the "initial" and the "terminal" point of a line. In other words, if a line goes from point a to point b, then the same line goes from point b to point a. The organization theorist will undoubtedly find this axiom unsatisfactory for many purposes. Even in dealing with communication networks there are sometimes difficulties. For example, the approved communication channels for transmitting "commands" or "orders" are rarely two-way. If unit a can transmit commands to unit b, we should not want to be required to assume that unit b must also be able to transmit commands to unit a. Similar considerations apply when dealing with other relationships, such as authority, responsibility, task or goal interdependence, and interpersonal attraction.

Organization theorists, therefore, should be especially interested in a theory of graphs which permits directed lines. Such a theory exists and is known as the theory of directed graphs, or more simply as digraph theory. A *digraph* is a collection of points and a collection of directed lines between some pairs of distinct points. The distinctive axiom of digraph theory asserts: if $\overrightarrow{ab}$ is a line of a digraph, nothing is implied concerning whether $\overrightarrow{ba}$ is a line of the digraph.

The higher-order concepts of digraph theory display a certain similarity to those of ordinary graph theory. These deal, for example, with directed paths, the distance from one point to another, directed cycles, and the effects of removing a point from the digraph. Some which hold the most promise for organization theory do not, however, have a clear analog in the theory of ordinary graphs. The directed graph shown in Figure 9 will show a common method of depicting such graphs.

Although digraph theory has not yet been used extensively in work on organizations, some interesting beginnings have been made. Heise and Miller (1951) have studied directed communication networks. French (1956) and Harary (1959*a*) have developed a model for dealing with directed influence processes in groups. And Harary (1959*c*) has shown how digraph theory may be used in treating status

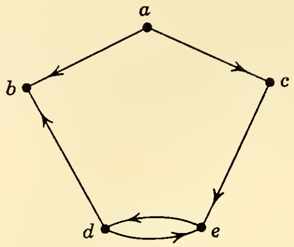

Figure 9

in an organization. The relative richness of digraph theory should make it especially useful to the organization theorist.

Number of lines between a pair of points

The axioms governing ordinary graphs permit at most one line between a given pair of points. Those governing digraphs allow at most one line in each direction between a given pair of points. This feature of ordinary and directed graphs imposes limitations on the usefulness of such graphs for the organization theorist, who may want to represent several different kinds of relationships between a given pair of units of an organization. One way of avoiding this difficulty is to construct several graphs for the same organization, one for each type of relationship. Thus, one graph might represent the formal authority-structure, another the informal influence-structure, and yet another the friendship-structure. Although this procedure is clearly of value, it provides no effective way to consolidate these various graphs into one representation of the organization.

A start has been made in graph theory to deal with this problem, though little theory has yet been developed. Such theorizing would employ the following definition: *a graph of type t* is one in which there are lines of *t* different kinds available to characterize, by superposition, *t* different relations. A pair of points of such a graph may be joined by no lines or up to *t* lines consisting of one of each type. Each type of line might be depicted by a particular color.

Graphs of a higher type should be especially useful in studying how relations of one kind influence those of another kind. For example, if the hypothesis advanced by Homans (1950) that interaction generates liking is correct, a graph of type 2 should tend to have a "liking" line wherever there is an interaction line. One should also expect to find definite relations between power lines and communication lines or "formal" and "informal" lines of various sorts.

Sign of a line

Sometimes it is desirable to be able to distinguish the "sign" of a line. This need arises when dealing with empirical relationships which have opposite states, such as like-dislike or facilitate-inhibit. Thus, a sociometric structure reflecting the likes and dislikes among people might be represented by a digraph in which a positive line from *a* to *b* indicates that *a* likes *b*, a negative line indicates dislike, and the absence of a line indicates indifference. Cartwright and Harary (1956) have employed signed graphs and digraphs in their formal characterization of the *balance* of a structure.

Strength of a line

Perhaps the most serious limitation of the graphs discussed thus far derives from the fact that only the presence or absence of an empirical relationship between two units can be represented. There is no way to distinguish amounts of authority, intensities of liking, probabilities of communication, and the like. What is needed is a mathematical system capable of treating structural properties of sets of relations each of which may vary quantitatively. Although the possibilities have not yet been explored exhaustively, it appears likely that graph theory and probability theory can fruitfully be combined so as to meet this need. Harary (1959*a*) has shown the direction in which this work may proceed in his treatment of power structures by means of Markov chains.

Summary

The central thesis of this paper asserts that the mathematical theory of linear graphs can be of considerable help to the organization theorist in dealing with structural properties of organizations. The belief that such help is possible rests on the conviction that a formal coordination can be made, linking the primitive terms of graph theory to those of organization theory. Specifically, it is proposed to coordinate "points" and "lines" of graph theory to "units" and "relationships" in organizations, respectively. Any such coordination, however, will have to conform to the axioms of graph theory, if graph theory is to serve as a mathematical model.

Four principal advantages would result from this use of graph theory. (1) A method for depicting the structure of organizations would be provided. (2) Rigorously defined higher-order concepts could be adopted into the language of organization theory. (3) Certain formulas and methods of calculation would be available for theoretical and empirical research. (4) The theorems of graph theory would indicate formally necessary features of organizational structure.

The theory of ordinary graphs was sketched out in order to illustrate these advantages. It was then shown that some of the axioms of the theory of ordinary graphs are not always appropriate. The assumptions that lines are necessarily symmetrical, that there can be no more than one line between a pair of points, and that all lines are of equal "strength" sometimes impose undesirable limitations. It was then noted that graph theory can meet these difficulties by modifying the axioms. The first of these difficulties has been essentially overcome by the theory of directed graphs (digraphs). A beginning has been made to remove the second restriction by defining graphs of multiple type. And, it appears that the third problem may soon be solved by combining graph theory with probability theory.

Even though use of presently available graph theory may force the organization theorist to employ some simplifying assumptions, the immediate gains should be considerable. The few attempts made to date have produced gratifying results. And, most important, as further experience is acquired it should not be at all difficult for mathematicians to advance the theory of graphs in those directions of greatest promise for organization theory.

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MASON HAIRE

10.

Biological Models and Empirical Histories of the Growth of Organizations

Introduction—The Biological Model

THE BIOLOGICAL MODEL FOR SOCIAL ORGANIZATIONS—AND HERE, particularly for industrial organizations—means taking as a model the living organism and the processes and principles that regulate and describe its growth and development. It means looking for lawful processes in organizational growth grounded in factors inside the firm, and for the forces shaping it as it grows. It means restating, in specific terms, the interdependence of size, shape, and function in organizations. Looking for these things demands something which, surprisingly enough, is rare in all the work on organization theory—empirical data on how organizations have, in fact, grown. From the point of view of the firm in its context of the economy, it means reviewing the problem of ecological equilibrium and its applicability to social organisms. In many ways this facet of the approach is only a little way removed from the "natural selection" interpretation of the growth of firms. Each of these things—lawful processes in the forces shaping industrial organizations; their grounding in constituent elements; the interdependence of size, shape, and function; the balance between firm and environment; and the actual histories of some firms' organizations—will be treated in a little detail in this chapter. Let us take them up briefly, one at a time, first.

Organization theories have covered a wide variety of approaches. The classical theorist—Urwick or Fayol, for instance—emphasized control, and a neat interlocking of functional specialties toward the institution's objectives (Urwick, 1944; Fayol, 1949). The decision theorists focus on another aspect. For them the structure of organization comes from the provision of information and decision at appropriate levels. Still another view is seen in the emphasis on the conflict between individual goals and organizational objectives (Argyris, 1958). None of them has focused on the fact that an outstanding characteristic of a social organization is simply that it is a special kind of aggregation of individuals. Many of the problems of organization seems to arise from two facets of this fact—first, that it is made up of individuals, and, second, that it is an aggregation of them. From the first comes the problem of conflict between individual and organization, and the organizational necessity of resisting the centrifugal force associated with individuals—each with his own goal and each tending to fly off from the path of the whole. From the second comes the pressure, as the size of the aggregation increases, to provide communication among the parts, integration of the parts into the whole, and the possibility of specialization of function.

It is in these last areas particularly—those growing out of the size of the aggregation—that the biological model seems most appropriate. Here, too, we have the problem of integrating the parts into a single functioning unit, of maintaining communication among them, and of developing and coordinating specialized functions. If we look at the living organism for a moment, while we think of the problems of an organization, the relevance of the model may become clear.

The first step—the interdependence of size, shape, and function—can be seen particularly well in an example of D'Arcy Thompson's (Thompson, 1952). Taking the story of Jack the Giant Killer, Thompson points out that Jack had nothing to fear from the Giant. If he were, as he is pictured, ten times as large as a man and proportioned like one, Jack was perfectly safe. The Giant's mass would be 10^3 or a thousand times a man's, because he was ten times as big in every dimension. However, the cross section of his leg bones would have increased only in two dimensions, and they would be 10^2 or a hundred times as big as a man's. A human bone simply will not support ten times its normal load, and the Giant, in walking, would break his legs and be helpless. He was trapped by a simple principle called the square-cube law which points out that in normal spatial geometry, as volume increases by a cubic function, the surface enclosing it increases only by a square.

We will have to come back to this square-cube law later, but it is worthwhile to spend a moment on it here, because it is of central importance. We see here the force of gravity acting to put a limit on increase in size without a corresponding change in shape. The organism exists under the pressures of the environment, and a simple relationship drawn from the geometry of its shape expresses the factor through which the environmental pressure is exerted. A man cannot grow as big as a giant and still have the shape of a man. A deer cannot grow as big as an elephant and still look like a deer; it has to look (something) like an elephant to support the elephant's mass. The size cannot vary completely independently of the shape.

A similar application of the principle shows the interdependence of functions with size and shape. Small, unicellular organisms can take in oxygen directly through the skin, and one side is sufficiently near the other so that oxygen permeates the entire organism. As an organism gets bigger, however, the same square-cube law, operating with atmospheric pressure, demands a change in structure and shape. In a larger mass, oxygen no longer permeates throughout, and it is necessary to provide specialized veins and arteries to carry the blood through the whole system. At the same time, the skin surface has become inadequate—growing only by a square—to assimilate adequate oxygen. New folds of spongy tissue—maximizing surface in relation to mass—develop (as lungs), providing a specialized function and shape to accommodate a change in size.

In dealing with the growth of industrial organizations, it has been customary to see the specialized function of the chief executive as the limiting factor leading to diminishing returns with increase in size. Since the supply of this specialty is inelastic within a firm but infinitely elastic within an industry, a limit is seen to profitable expansion. It seems likely, however, and empirical evidence seems to suggest, that the limitation also comes from other implications of the size-shape-function relationship. As the organization grows, its internal shape must change. Additional functions of coordination, control, and communication must be provided and supported by the same kind of force that previously supported an organization without these things. If the relationship were linear, there would be no problem. If each increment in size produced one increment (or one plus) in productive capacity and needed one increment of additional supportive function, there would be no limit. However, in the organism, the proportion of skeleton needed to support the mass grows faster than the mass itself and puts a limit on size as a function of the environmental forces playing on it. Similarly, it is suggested that, as the size of a firm increases, the skeletal structure (needed to support it against the forces tending to destroy it) grows faster than the size itself, and hence comes to consume a disproportionate amount of the productive capacity of the organization. If this is so, it becomes important to identify the skeletal support of the firm, the forces it resists, and the rates at which the support must grow. Some empirical findings will be presented along these lines.

In the organismic examples used above, it was the force of gravity, and the closely related atmospheric pressure, which impressed modifications on a living form as its size changed. In organisms of other scales of size, other forces seem primarily determinative. In small insects, for example, where the ratio of wet weight to dry weight is high, it seems to be surface tension which determines modifications in form (de Beer, 1924). In still smaller microscopic organisms, it may be the shocks and jars associated with Brownian movement. What kind of force field can be the relevant one for social organisms? It is hard to hypothesize. However, knowing something of the forces operating on living organisms, we could study the modifications with growth, and see the operation, for example, of gravity. In industrial organizations, we can study the history of growth and infer the operation of the forces from the direction of changes in shape and function as size changes. With adequate empirical histories it should be possible to infer some of the characteristics of the force, even before it is possible to identify it.

One of the kinds of forces that has been suggested in this connection is that connected with the competition among firms within an industry. Probably no one who has attempted the introductory explanation of such competition has been able to avoid some reference to the analogy of the trees in the forest, the relation between the size of individuals and the number in the group, and the growth of one at the expense of the others. Certainly this kind of environmental equilibrium in the competitive field must work on firms, just as it does on living organisms. And yet it still seems possible that there is an entirely different kind of force, associated with factors largely internal to the organization. In the same way, internal physical forces act on organisms in addition to the pressures on them arising from their ecological equilibrium. Kenneth Boulding (1952) has pointed to this kind of homeostatic balance, going beyond the simple competitive pressure, but without specifying the forces in great detail. It seems likely that there are forces within the organization, arising from the fact that it is made up of individuals, which determine the course of its growth. They would be the forces associated with the cohesion of groups; with the demand for integration and communication; and with the development of specialization of function. Again, one may hope that a collection of empirical histories of how organizations have grown will give us a suggestion of the forces determining their growth patterns.

Some kinds of clues seem to exist to help in this job. For one thing, in physical organisms, the form itself shows where the force tending to destroy the organism is strongest. A shelf bracket is thickest and strongest where the tendency for the loaded shelf to break from the wall is greatest. The bowstring arch of a bridge is shaped as it is, not for aesthetic reasons, but to provide maximum support where the weight associated with the size of the bridge tends to destroy it. In general, as physical objects get bigger but retain the same proportions, they get weaker, and a larger and larger proportion must go toward supporting their own mass. Consequently, with increase in size their forms are modified to resist the force associated with size. The appropriate modification is a clue to the force. The appropriate support for a physical structure is a perfect diagram of the forces tending to destroy it. Similarly, in the industrial organization, special attention to the modification of form as size increases may give us at least a clue to the strength of the force tending to destroy it, and to its point of application.

One of the things that made it possible to see the pressure of forces on the physical organism was the simple geometry of the situation. The powerful square-cube law flows from the relation of surface and volume in conventional space. Again, successive representations of a physical form at different stages of growth makes it possible to see points of relative growth, much as time-lag photography makes it possible to see the order and direction of growth in a plant or flower. In industrial organizations, the conventional "family-tree" kind of representation seems poorly adapted to this kind of geometry, and shows us little of the pattern of growth. The preliminary empirical data to be discussed here will also be focused on this problem of the appropriate geometry for representing growth in social organizations. Some first theoretical and empirical steps have been made in the representation of group geometry, and we will point to their application to industrial organizations.

Empirical Histories of Firms

In order to see some of the phenomena of growth in industrial organizations, let us look at the histories of some actual firms.[1] Four companies will be reported on here. These reports are the first results of a research project designed to study growth, and the sample is not necessarily representative of all of industry along any dimension. Several factors dictated the choice of companies. One of them was the simple availability of the firm and the cooperation of the management. To make accurate studies, it was necessary to take payroll records, telephone books, organizational charts, and similar data back to the beginning of the company; finally, sometimes we had to interview the oldest living inhabitants about the origins. These procedures were expensive both for the companies and for the research workers, but accurate data on size and assignment were seldom readily available. Another selective factor, associated with the first, was size. To encompass data of this kind in the early stages of investigation, it was necessary to use relatively small groups. The four firms reported here recently totaled about 2,000, 200, 275, and 300 employees; larger organizations will come later. Still another criterion was youth; in the first studies it seemed useful to try to get companies in which it was still possible to trace histories from the start. Finally, an attempt was made to choose firms where the growth was rapid and where technological advantage in the company materially reduced the pressure of competition on the firm's growth.

General growth

The over-all growth of these firms in terms of total employees is shown in Figures 1–4. They show various slopes of exponential functions. Figures 5–8 show the same data fitted with theoretical curves. The curves are the logistic equation often applied to population growth. The assumptions are simple. In the first case (illustrated in Figures 1 and 5), it is assumed that each member of the population at a given time produces 1.5 offspring in the next generation. The rate of increase can be determined from the first few

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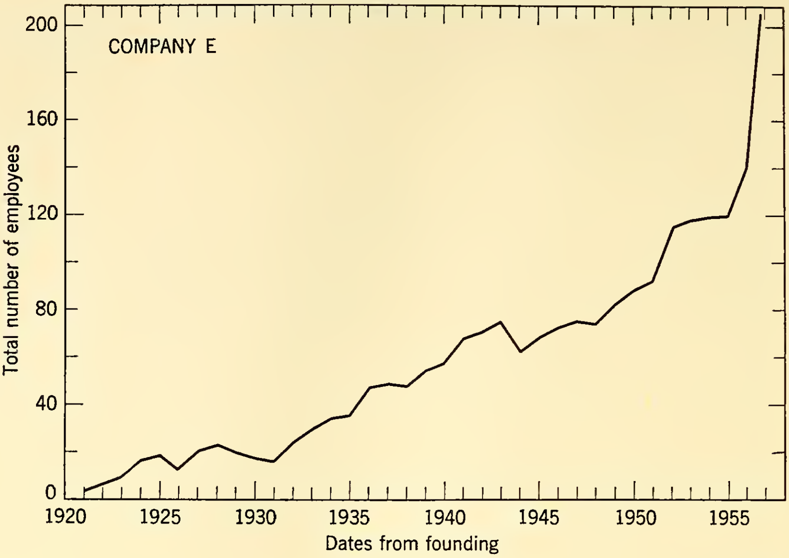
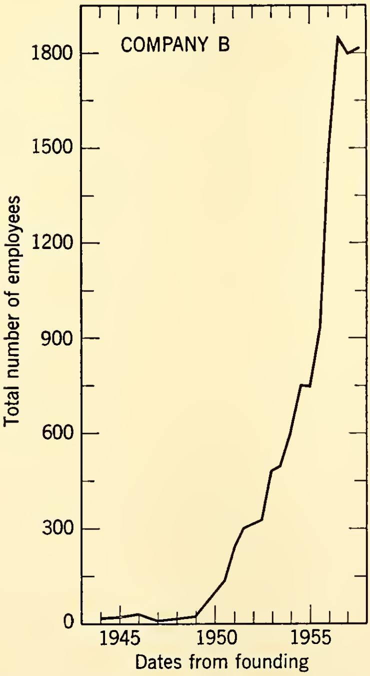
[1] The empirical work reported here was supported by a grant from the Foundation for Research on Human Behavior and was done at the Institute of Industrial Relations at the University of California, Berkeley.



▲ Figure 2



◀ Figure 1

Patterns of growth in four manufacturing companies.

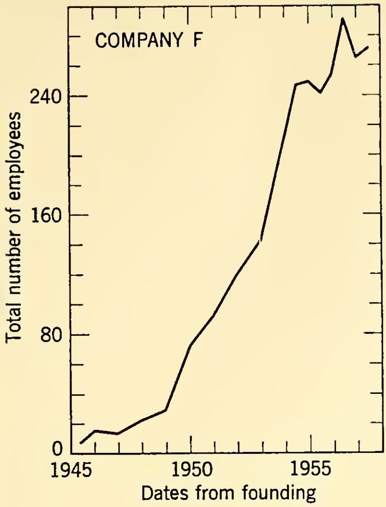


Figure 3

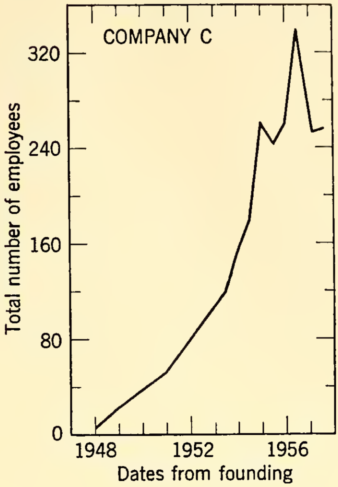


Figure 4

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generations. From then on, the growth is described by a simple equation

$$\frac{dN}{dt} = N \log_e R$$

where R is the rate of growth, here established by the increase in the first three years. Once this rate is observed, the number of people employed is obtained (in the theoretical curve) by the expression $N = N_0R^t$. It will be noticed that the observed growth over a period of fourteen years fits this simple formula remarkably well.

Here the rate of growth was taken at 1.5—the average in the first three years. That is, each employee makes it possible for there to be 1.5 employees in the next "generation." This description is for a population of unlimited expansion, where no environmental pressures reduce growth. In general, in living organisms, as populations grow they encounter limitations imposed by the environment. They use up the environmental support—space, nourishment, air, etc.—and the description of their growth must be limited by a factor associated

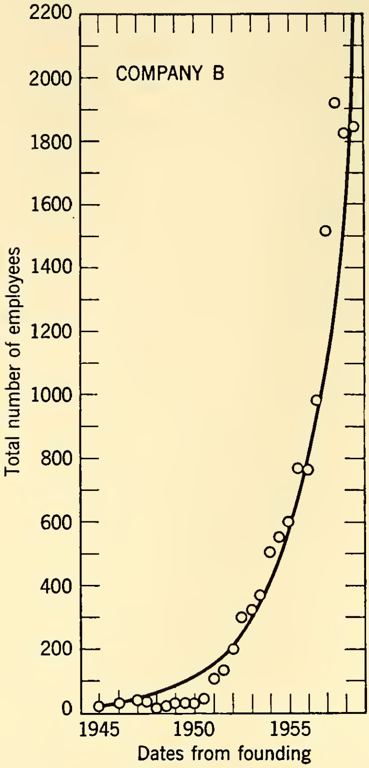


Figure 5

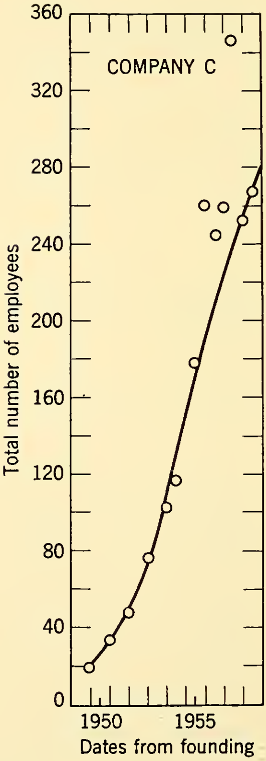


Figure 6

with this. To take account of this, the logistic curve describing the rates of growth is often modified to the form

$$\frac{dN}{dt} = \left(\frac{K - N}{K}\right) N \log_e R$$

where K is the limit on the size of the population imposed by the existence of limited environmental support. Figures 6, 7, and 8 illustrate applications of this expression and describe growth. Again, the rates of growth are taken from the first years, and the values of K are somewhat arbitrarily assigned to express limits for these firms. It will be noticed that the observed growth fits growth as predicted by the simple theoretical function, even though only two or three years are used to predict growth achieved in a period of ten to thirty-five years.

The roles of the R and K values in these equations are worth a little special attention. These two values determine the slope and the shape of the curve of growth. In living organisms, for example, different strains within a species show characteristically different slopes, paralleling one another at their own rates. Again, in living organisms, it is possible to vary the K values experimentally by manipulating the nourishment available in the medium of growth, and produce members of a family of curves fitting the same equation with different values. Here the R and K values seem likely to be associated with characteristics of the industry. The rate of growth seems related to the technological character of the process and the attendant ratio of investment per worker. The K value may be associated with the related state of competition in the industry and the demand for the product.

Apart from the problem of organizations, it would be delightful if it were possible to observe two years of growth and predict the next fifteen, as in the company pictured in Figures 1 and 5. Investment, for example, would be tremendously simplified. It should be pointed out, however, that while the values of R used in these equations are empirically determined by observing the first years' growth, the K's are quite arbitrarily chosen. However, it does not seem impossible to develop rough approximations of the limiting values characteristic of the demand and competition in an industry to provide general guide lines.

The use of a simple curve without limitation to describe the growth of a company as in Figure 5 is obviously unrealistic. With the rate of growth of exponential functions, it would mean that quite soon the company would employ everyone. It seems likely that this is not simply the lack of a good value of *K*, but that eventually another value of *R* will have to be applied. At what stage this inflection comes, and what causes it, is part of the problem of the internal price paid for increase in size.

The possibility of fitting a group of diverse companies' histories with a set of curves generated from a single, simple principle is a heartening suggestion in the search for lawful processes of growth. The assumptions behind these particular functions may not be ideal, but some equations may be found to fit more broadly. In the firms reported here, the deviations from fit are interesting. In Figures 5 and 6 it will be noticed that the values for 1956 are well off the theoretical curve, but that the succeeding points return to very good

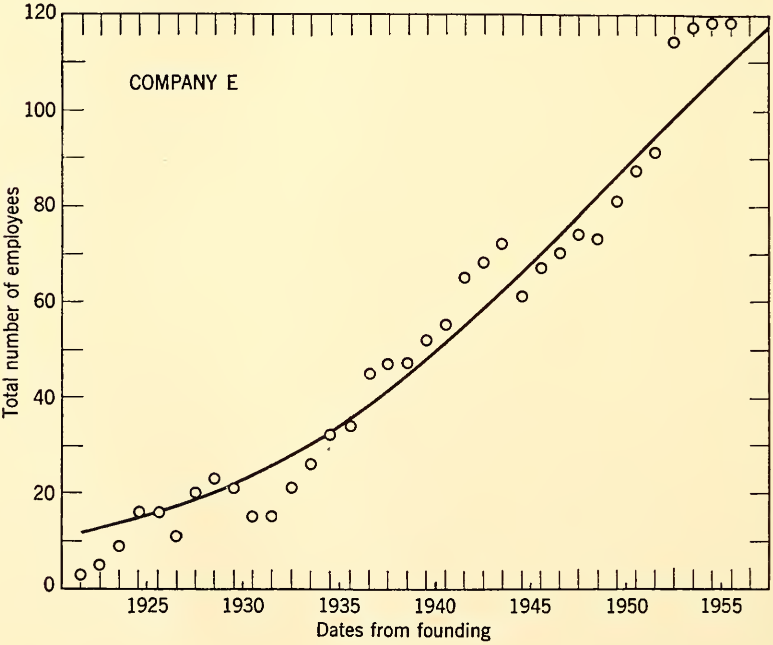


Figure 7

approximations of the value. As for the company in Figure 6, it was possible to interview the president about the growth. Referring to the 1956 spurt, he said, "We just got too big too soon and began to lose money. We had to trim back to a reasonable size." In both instances, the return to the pattern predicted by earlier growth suggests the operation of inexorable forces operating on the social organism. Again, in the company represented in Figure 7, it is clear that a single curve fits the growth for a considerable period of time, but that in recent years a quite different pattern appears. It was at this point that the company, which had been privately held, became the wholly owned subsidiary of a larger firm, with the attendant capital opportunities and expansion of marketing and distribution facilities. Again, this change in the basic curve suggests a place to look for the values associated with the description of orderly growth processes within industries.

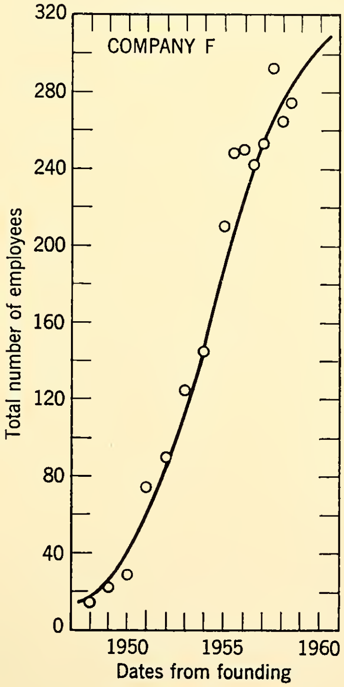


Figure 8

The geometry of growth

In discussing living organisms, particular attention was called to the square-cube law as an illustration of the application of environmental forces and also as characteristic of the geometry of the space in which physical objects grow. It would be immensely useful for the study of social organisms if a similar geometry could be developed for the space in which they live. In order to take a first step in this direction, an attempt was made to apply the square-cube law to the firms studied here, and reported above.

The square-cube law describes an invariable relationship between surface and mass of physical bodies. To apply it to companies, a naive definition was made of "inside" and "outside." "Outside" was taken to mean all the people having to do primarily with things outside the firm. Purchasing and shipping employees; receptionists, and the like are outside. The labor negotiations are external while the personnel function is internal. Often, individuals had to be split up and assigned partly to one and partly to the other. A set of definitions of this sort was established and then applied to the four firms. It was further assumed that the area of the surface of the firm was best measured by the number of people who inhabit it, and similarly for the volume. Both these assumptions—the definition of internal and external, and the measurement of surface and mass—are first approximations and subject to modification, but they seemed the best available at the time.

The square-cube law says that mass grows by a cube function while surface grows by a square. If one were to take the cube root of volume and the square root of area and plot them for different stages of growth, the result would be a straight line from the origin with a slope of 1. As the cube of the mass doubles, the square of the surface doubles. The line would be described by the single regression formula

$$y = a + bx$$

in which the intercept is 0 and b is unity.

The four firms studied are plotted in this fashion, and the results appear in Figures 9–12. It will be seen, first, that the square of the outside and the cube of the inside in each case provides a very good fit to a straight line. Nothing in the nature of the definitions—apart from the geometry of the space in which they exist—demands this. There is no immediately obvious organizational artifact that imposes this orderly progression on each of the growth patterns. It looks as if a geometry very similar to conventional spatial description can be used in picturing social bodies.

The fits to a straight line are very good in each case. The correlation coefficients of the four plots are .99, .96, .95, and .97, indicating remarkably little variance from linear progression. As was true in the general growth curves, the first few years establish slopes which describe succeeding relationships in growth very well. It should be pointed out that these regularities and the great similarity from firm to firm occur in spite of wide differences in conventional operating descriptions. One of them (Figure 12), for example, does little direct marketing itself, but disposes of manufactured products entirely to a handful of large firms in the field who retail it. Another (Figure 9) works directly with a dealer organization for part of its product, while a third (Figure 10) deals mostly with a very limited group of customers under government contract.

Two other things stand out from these plots. In the first place, each of them has an intercept greater than zero on the axis representing the cube root of the mass. In other words, here it is possible to have zero surface and some mass—an impossibility in physical geometry. This may be an artifact of the definitions, and they could no doubt be adjusted to remedy it, but it seemed better to leave them as they were set up *a priori* without the influence of observed data. On the other hand, positive intercepts may be characteristic of industrial organizations so plotted, and it is worth noticing that all four have remarkably similar values of about 1 or 2 on the y axis.

The second deviation in these data is in their slopes. In physical objects, as was pointed out, the square-root–cube-root plot yields a slope of 1. In these cases, the slopes are .72, .51, .50, and .97. Again, these variations from unity may be artifacts of the definitions or may be characteristic of the geometry applying to such social organizations. Certainly there is a remarkable similarity in the slopes.

The regularity with which these data fit simple expressions derived from a geometrical model strengthens the possibility of an eventual representation of social groups in a useful geometry. If that were possible, as has been suggested, it would enable us, with successive representations, to see changes in shape with growth, and from this to infer the size and direction of the forces associated with organizational expansion. A real possibility in this kind of representation seems to exist in the somewhat geometrical model Bavelas (1948) has proposed for describing communication nets in organizations. He provides definitions of radii, and centrality of parts and neighborhood which make possible a spatial definition of organizations. Danzig

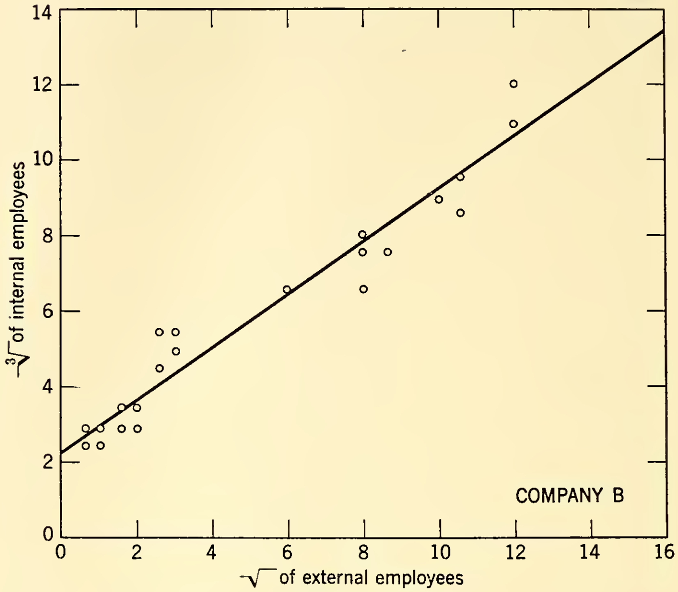


Figure 9

and Galanter (1955) have used very similar definitions in studying the operation of work groups of about two hundred people, and their results show that it is operationally possible, and that the results are meaningful. If, for example, one were to determine all the radii within an organization, their proper ordering would uniquely define a shape. Successive representations of this sort would show us where the shape had to be modified over a time to accommodate growth, and hence would be an index of the pressures associated with size and shape in social groups. Three things seem to combine to make this a very fruitful possibility for the study of industrial organizations: the existence of theoretical models of the type of Bavelas'; the operational success of the Danzig and Galanter application; and the regularity

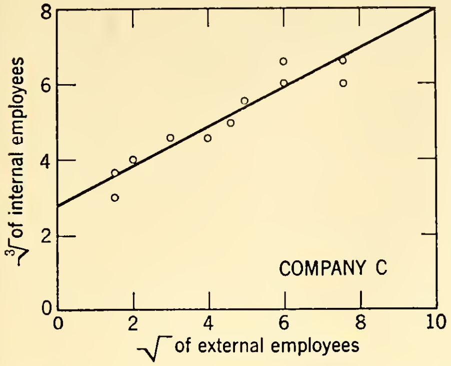


Figure 10

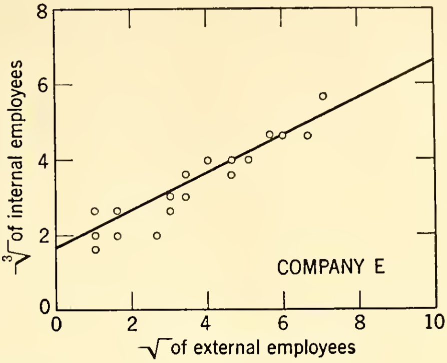


Figure 11

Internal-external analysis with regression lines superimposed. Abscissa = $\sqrt{\text{external employees}}$. Ordinate = $\sqrt[3]{\text{internal employees}}$.

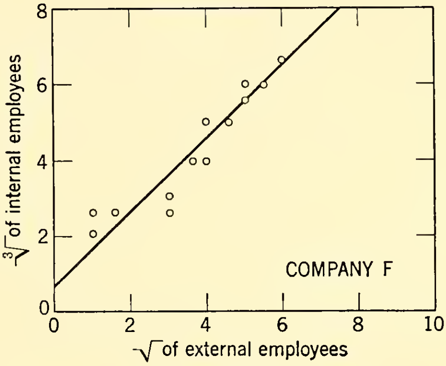


Figure 12

with which geometrical concepts described here seem to portray the orderly process of growth.

Internal changes associated with growth

Physical models of organizations lead us to notice the relative proportions of parts as the size of the whole changes, and to measure the proportion progressively assigned to such functions as communications and integration. A look at the internal changes in the organizations studied will give us some suggestions about these problems and will provide also some data on growth of functions which have been conspicuously lacking in discussion of organizations.

The relative proportions assigned to line and staff are shown in

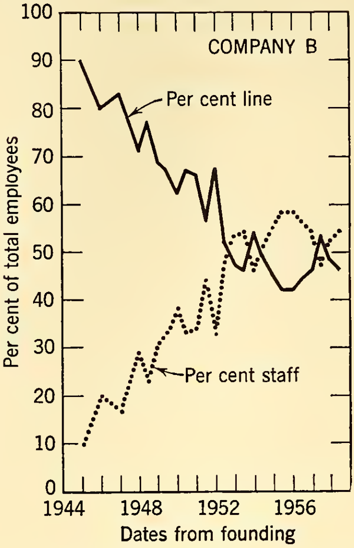


Figure 13. Per cent of line and staff personnel.

Figures 13–16. It was necessary to provide some definitions of line and staff to make these measures comparable from one firm to another. In industrial practice there seems to be no uniformity in the use of the terms. Here the distinction is made as follows: the "line" includes those who directly make and sell a product; the "staff" includes those who provide specialized support, advice, and help. In borderline cases the proximity to the product and direct control over it were taken as determinative. For example, product planning, when intimately connected with the actual production organization, is here considered as line; product research is not. Similarly, a quality-control function may operate as part of the line, if it is immediately in the operation and stops production, modifies practice directly, and rejects output. In some instances, it serves a staff function when, for example, it is a more removed reportorial service comparable to the financial control afforded by bookkeeping practices.

Two patterns seem to appear. Two of the firms stabilize at about fifty percent devoted to staff, and two at about twenty-five percent. All four companies seem to show a relatively stable proportion in recent years. In all of them the initial proportion, of course, was virtually one hundred percent line. The average size of these companies in the first year of their operation was about eight people, a figure which neither requires nor leaves much room for functional specialization. Beyond this point, however, all four show a rapid shift toward a higher proportion of staff, and the first six to ten years in each firm showed a steep increase in the percent of staff until the figures stabilized.

There seems to be less relation between absolute size and the steady state of the line-staff proportion than with age. The sizes varied considerably, but the age of six to ten years at the time of steadying gave a narrower range. The fact that three of the four companies are young, with their staff growth in the recent post-war years suggests that it is perhaps more a function of the times than of growth in general. The fourth company, however, shows much the same pattern, though its main staff growth reached just into the depression thirties, suggesting that the particular times are not determinative.

The rapid rise of the proportion of the whole allocated to staff function with early growth takes us back to the argument about the shelf bracket. The brace is strongest where the force tending to destroy it is greatest. If this is true in industrial organizations, the force tending to destroy is greatest at the point where it is shored up by increased staff. What can that force be? The two main functions of the staff are to provide information for control and coordination, and to provide expert assistance beyond the skill or training of line executives. The pressures which threaten to crack the organization as size increases must be in these areas.

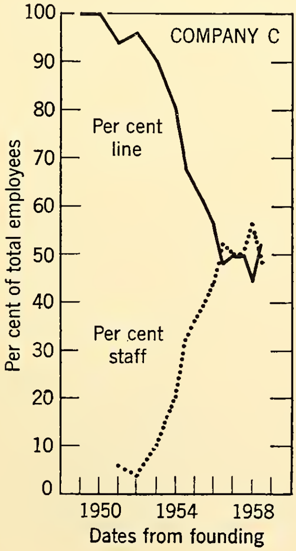


Figure 14. Per cent of staff and line employees.

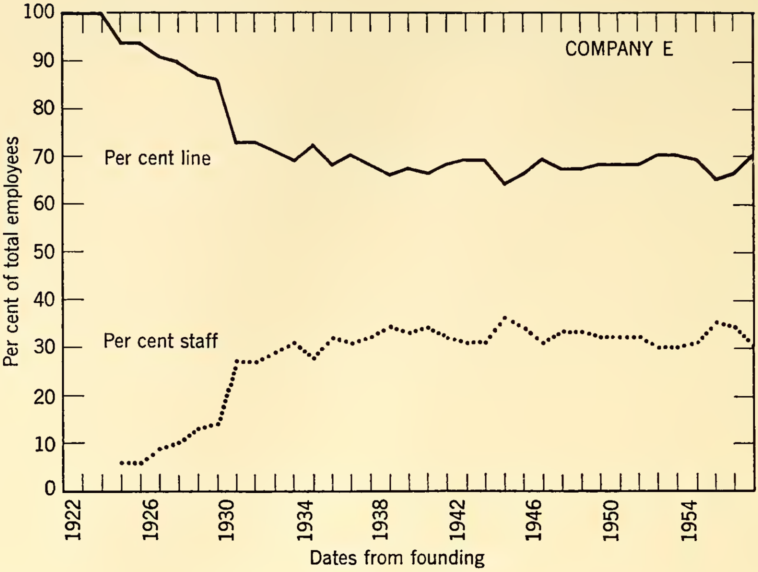


Figure 15. Per cent assigned to staff and to line.

It seems fruitful to think of an organization as built on a module determined by the amount and kind of work one man can do. The best definition of a superior in the hierarchy is that he is responsible for more work than one man can do. As the job grows to be more than he can do, he is given subordinates to help him get it done. In this manner a new level is created in the organization. When the job of supervising these subordinates grows too big, he is given sub-subordinates. In general, the vertical extent of the organization grows out of this simple module of the amount of line work one man can do or supervise. To be sure, this same pressure sometimes expands the organization horizontally—divisions are created for line specialties, or, more often, to accommodate geographical distributions of the basic activities—but the real branch organization comes from another pressure. Levels are formed, in general, when a man has more than he can do of essentially the same kind of responsibility he has had. However, where a special expertise is required, usually somewhat different from the basic function, the horizontal extent is increased by the addition of branches. It is still the same module—what one man can do—but in a slightly different realm of competence. The specialized functions are of two rough types: control and coordination, as in the case of personnel function, financial control, quality control, and the like; and technical specialties such as research and development, advertising, legal counsel, and, perhaps, industrial relations.

These two pressures flowing from the amount of work one man can do seem to be at the base of the direction of growth of companies. Roughly, when it is more work of the same kind, we have vertical extension; when it is special competences, horizontal. Can these be said to be the pressures tending to destroy the organization? I think so. Whyte (1948) gives a delightfully succinct history of the growth and decline of a restaurant—the industry in which more organizations fail early than in any other. Here the one-man diner flourishes. The owner has been cook, counterman, and cashier, as well as greeter and purchasing agent. He expands and now must keep the cook cooking well, the waitresses efficient and happy, and the cashier honest. He has functions of public relations to supervise (but not to perform) as well as those of labor relations, purchasing, and the like. Very often, in the Shakespearian mold, the very qualities that lent him his worth in his individual operation lead him to fail, as he cannot effectively assume his new responsibilities. They are of two kinds: as supervisor he must get the subordinates to help him get the work done and keep information flowing back and forth for control

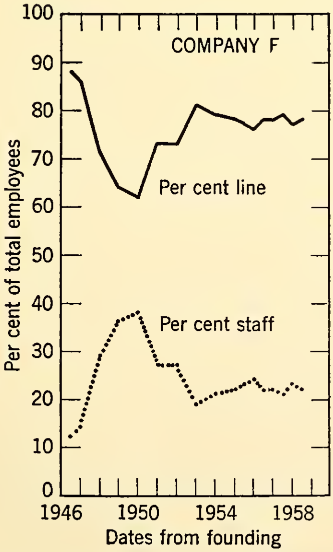


Figure 16. Per cent of line and staff personnel.

and coordination; as manager he must have the specialized skills of the staff branches, often before he can afford to represent them in individuals.

In the cases reported here, it is the support for these supervisory and managerial tasks which grow most rapidly in the first six to ten years. Apparently the basic line function grows without much threat to the life of the social organism. The structure is strengthened most to provide support for control and coordination on the one hand, to expert assistance for policy-making and planning on the other. It seems reasonable to argue that the relative growth of staff to line provide a parallel to the shelf bracket or the bridge arch—the organization grows fastest where the force tending to destroy it is strongest; the shape of the support is a diagram of the forces acting against the structure.

Before we leave the staff-line relationship, one or two other points are worth noticing. It has been argued that as the line grows by a linear function, the staff will grow geometrically (Davis, 1951). This old wives' tale—which, like many pronouncements having to do with organization theory, is completely unsupported by empirical evidence —seems to be widely accepted. Only one study of the facts in the case has come to light. Baker and Davis (1954) have shown that, in surveying about two hundred companies, the line and staff both grow linearly. Unfortunately, Baker and Davis' data are also misleading on this point. They questioned companies at a point in time, to get a cross-sectional rather than a longitudinal result. Then, when they plot size of staff against size of total, they get a spurious growth curve. It is not a curve of growth representing the dynamics within an organization, but a set of static measurements arranged by size.

The four companies studied here, while differing considerably in their patterns of growth, all show both the points mentioned above. In the early years, while the line grows linearly, the staff grows by some exponential function (though no single one seems to describe the curve well). Later, in another period of growth, they grow at quite similar rates. In terms of rough averages, during the period when the line first doubled, the staff grew about six times as large. When the line next doubled, the staff grew about five times; the next doubling of the line was accompanied by a tripling of the staff, and from then on they (approximately) each doubled. Early, the staff grows geometrically as the line grows linearly, but this relation tapers off to parallel growth.

Two other points might be noticed with regard to the staff before we leave it. One is the remarkable resistance of the staff to negative growth. The companies studied did not all grow uniformly larger. At times they cut the total personnel. In the total histories observed, there were nineteen such cases of layoffs, totaling 311 people from all firms. What proportion of these were line and what were staff? During the time in which 311 were laid off, there were actually 325 line workers furloughed; fourteen new staff people were hired during the very layoff period. Many reasons might be advanced for this. Staff people are specialists and harder to come by than line; it is simple economy to save them. Cutting down line and saving staff builds for the future. When business picks up again the line workers can be rehired to take places in the organization the staff has held intact. A more cynical interpretation might be that the staff plans and designs the layoffs, though line management makes the policy. No one ever plans to let himself go. Indeed, the process of laying off apparently required more staff to do it. Whatever the reason, it is clear that the staff is the place to take a job. It seems to have built-in tenure.

A second point which might be mentioned is the considerable regularity shown in the point of introduction of one staff function—personnel. The four companies had separate personnel people when their sizes were 177, 152, 138, and 248. Except for the last one, the figures are remarkably close together.

The growth of supervision and the span of control

Earlier we referred to the idea that the limiting condition leading to diminishing returns is based on the fact that the pyramidal shape of an organization always has a single individual at the apex, and that this chief executive's function is inexpandable within the firm. This view of the function of the executive seems to be based on two notions: one, that there is a unit of decision-making potential of finite size, which can be stretched to cover only a certain amount of operation; and two, that there is a "span of control" which limits, more or less absolutely, the rate at which the pyramid can spread out beneath the top executive. The first notion—of an indivisible, inexpandable unit of decision-making—seems to leave out the possibility of decentralization, and the extreme of virtually autonomous organization within a single skin in the style, for example, of General Motors. While there may be an eventual upper limit on size associated with the operation of a factor of this kind, it does not seem to be limiting in the range of sizes which characterizes most of the industry. The second assumption, about the span of control, is even more tenuous. For one thing, even granting the reality of this span, it is not very sharply limiting. A figure of eight subordinates controlled by each superior occurs quite frequently in writings about span of control. In practice, a company with six levels of command below the vice-presidents is not out of the question. This would give us six levels of superiors with each man supervising eight subordinates. Such an organization would have a total payroll of 8^6 or about a quarter of a million; if we increase the span of control to ten, the same-shaped organization would give us a million employees. Surely this factor does not limit the size of industrial firms in the ranges with which we are familiar. Again, in practice, this kind of span of control does not seem to fit observed facts; Sears Roebuck is the classic example in which the number of subordinates reporting directly to policy-making levels has been increased well beyond the number usually discussed. Sears often has fifty subordinates reporting to a single man. To man a full organization of six levels, with fifty men reporting to each superior, would take one hundred times the population of the United States.

The idea of the span of control in itself is an interesting one. It is often discussed as if there were some absolute answer to the question—"How many subordinates can a superior manage?"—as if the span were a kind of inflexible constant in social organizations, rather than a factor which itself is variable as a result of a number of things such as: the training of the subordinates; the objectives of the group; the situation in which they find themselves; the communication facilities available to them; and the like. The idea of span is often traced back to the military organization, where the principles of squad-platoon-company organization has perhaps become too fixed in many of our minds (Hamilton, 1921). The squad organization is relatively recent in American military history, and it seemed to emerge for two main reasons which are important to students of organization. Through the Civil War, the main tactical exercise was the movement of large masses of men under the immediate control of high-ranking officers. The squad as a unit does not appear in American army organization until the *Infantry Drill Manual* (1891). General officers attempted to control directly the activities of whole armies and corps. It was partly this which accounted for the appalling loss of high-ranking officers on both sides in the Civil War; Stonewall Jackson, in the second level of command immediately below Lee, was killed in just such a foray to exercise immediate command over front-line troops. This striking example of the considerable cost of the failure to decentralize command might be taken as a suggestion to top executives to stay off the production floor.

After the Civil War the units of the American armies were forced to the smaller span of control by improved weapons technology—the development of the Minie ball whose effectiveness made massed formations lethal—and it was made possible by the beginning of telegraphic communications for strategic, if not for tactical, control of the battlefield. These two factors seem to be the important ones in connection with the military history of the span of control, and they should be borne in mind in studying any organization: the change in what might be called "productive" technology determines the appropriate size of the unit; and the decentralization of authority demands vastly better communications—faster, more complex, and with more connections. Function, size, and shape are interdependent.

In dealing with principles of management, one often sees references to Graicunas' formulation of the limitations of authority (Gulick and Urwick, 1937). Graicunas stresses the number of relationships with and between subordinates as their number increases. Using almost all possible relationships, he comes to a formula of

$$r = N\left(\frac{2^N}{2} + N - 1\right)$$

where r is the number of relationships and N is the number of subordinates. With three subordinates, for example, we get a total of eighteen relationships, with four, forty-four. These surprising totals, however, are achieved only by taking a most elaborate view of human interactions. We must consider A's relationship with B in C's presence separately from his relationship with B alone and separately from his relationship with C in B's presence, and include B's relationship with C as well as C's with B. While all these relationships are logically contained in the system, it is not clear how they limit the span of control. Koontz and O'Donnell (1955), for example, say:

> An executive with four subordinates may well hesitate before adding a fifth member to the group when by doing so he increases the total possible relationships *for which he is responsible* [italics mine] by 127 percent (from 44 to 100) in return for a 20 percent increase in subordinate working capacity.

Surely this is just plain silly. Students must have been misled by the mathematical nicety Graicunas introduced in a previously foggy field. Making the superior responsible in any direct sense for all the relationships between and among his subordinates seems to extend unduly the functions of the executive. It would seem to me that these figures point again to the complexity of communication required to maintain contact within a growing organization, rather than to a limit on the realm of authority of the manager. This communication problem is one to which we will have to return later.

When we look at the average number of line production workers supervised by first-line foremen, the simple ratio of one to eight does not stand up. In 1958, the four companies had an average of thirteen production workers reporting to each line foreman. The companies varied between themselves. Over their total life, the average number of men reporting to a supervisor were 19, 18, 7, and 13 for the four companies—a ratio of about 1 to 14 for all four companies for their total life span. The ratio of supervisors to supervised does not go up as the company grows. On the contrary, as the line increased, each supervisor was responsible for more men. To return to the argument from the shelf bracket, more supervision is not one of the supports against the destructive forces associated with size.

Table 1

Average Number of Employees per Supervisor

Size of Company	Average Number Supervised
20–50	11.5
50–100	14
100–200	12
Over 200	21

Table 2

Top and Middle Management as a Percent of Total

Size of Firm	Percent in Top and Middle Management
20–50	13.6
50–100	10.5
100–200	5.9
Over 200	4.1

The ratio of top and middle management shows an even greater decline with increasing size. Table 2 shows the general relationship. When the firms are small the ratio is somewhat misleading, since there is an almost irreducible minimum of management no matter how small the total. Using a table similar to that given for first-line supervisors, the decreasing ratio is clear. Management grows in size as the total grows, but more slowly than the total, and it is an increasingly smaller part of the whole. The strength that management provides does not need to be increased more than proportionately as the company grows. Contrary to the argument that diminishing returns come from a pinch at the top, in the range of sizes studied here, the top seems perfectly adequate.

The rise of the clerical function

Parkinson has made us all self-conscious about the clerical function in modern organization. To look at this, a special tabulation was kept in these four firms of all the people who were primarily paper handlers of one sort or another. The total number of clerical workers does increase as the company increases. In general, as the companies went from forty to eighty employees, the clerical staff doubled, and the doubling of total size and clerks roughly continued. The table shows some variation, but not the alarming growth one might expect. The curves in Figures 17–20 show the same story: growth, but not runaway growth of the clerical function. Figures 21–24 show the growth of the clerks not as a function of size, but as a function of time. As a company ages, the tendency to acquire a larger percentage of clerks appears. Part of this may be the staying power of the staff mentioned earlier. Or, in part, it may be a kind of agglutinative accretion, as when a line promotion requires a new secretary because there is no room for salary increase. In any case, the number and proportion of clerks tends to grow and grow.

Table 3

Clerical Workers as a Percent of Total

Size of Company	Percent of Clerks
20–50	12
50–100	15
100–200	12
Over 200	14

The clerks have been treated separately from the staff for the present study because of the timeliness of the interest. They belong to the staff, however, and, as such, it is worthwhile considering their function for a moment. They are part of the general function of control, coordination, and communication which increases rapidly as the size increases. These functions are the responsibility of the line, but they are largely implemented by the staff. We saw that the staff in-

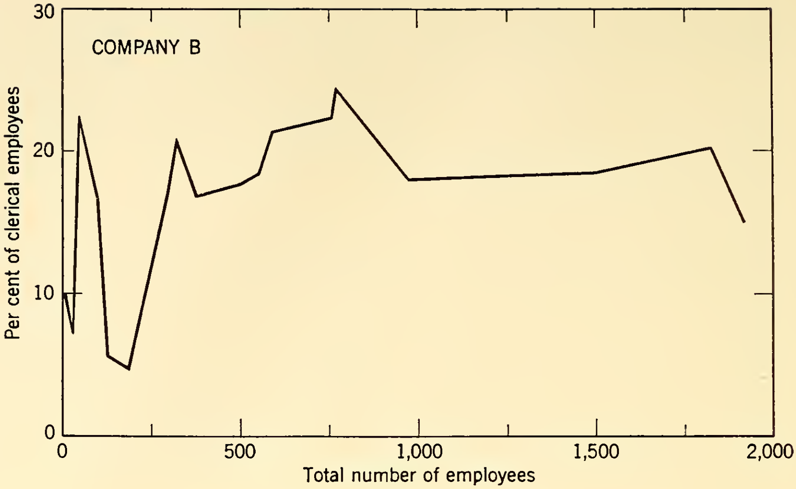
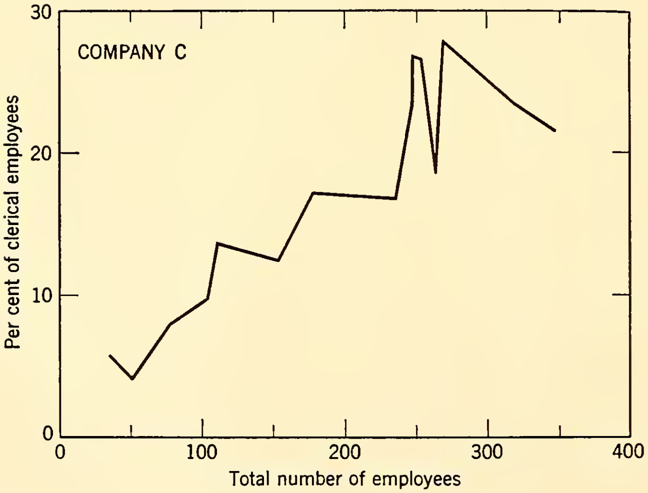


Figure 17



▲ ▶

Clerical workers as a per cent of total.

◀

Figure 18

creased by a factor of six when the line first doubled; the steady growth of the clerical function gives another clue to what is happening. The clerk's job is largely concerned with information—recording, duplicating, disseminating, keeping, and finding information—to support the integrative function.

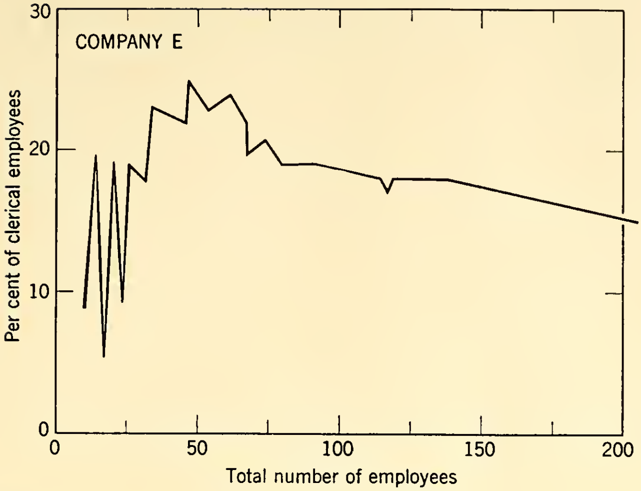


Figure 19

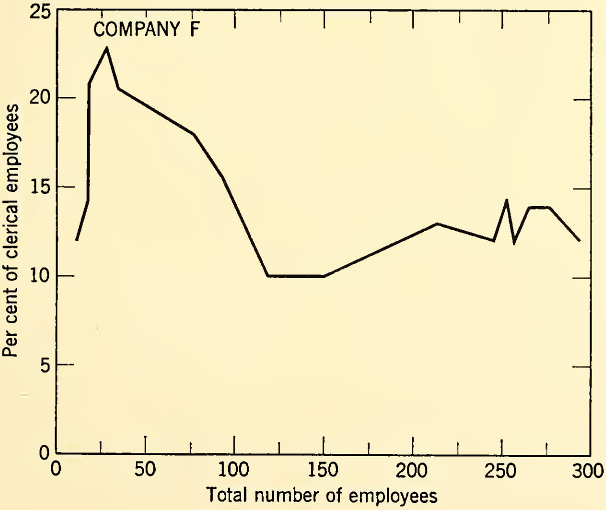


Figure 20

In the biological organism there is the same pressure for information in the interest of integration. Part of it is answered by the growth of the nervous system into a more complex network. Part of it is met by a simple increase in the speed of the transmission of the signal. For example, in a sea-urchin egg, without a proper nervous

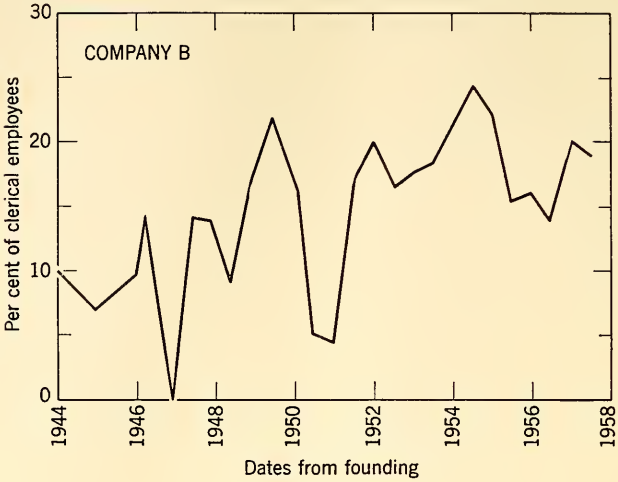


Figure 21

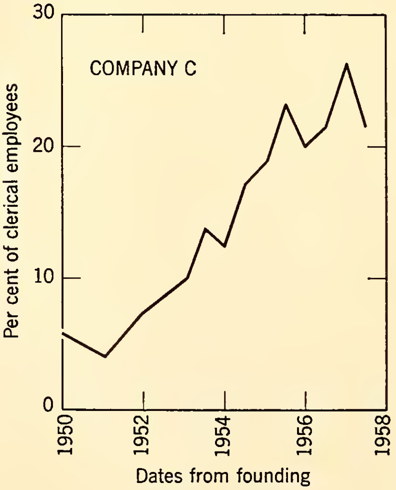


Figure 22

Per cent of clerical workers through time.

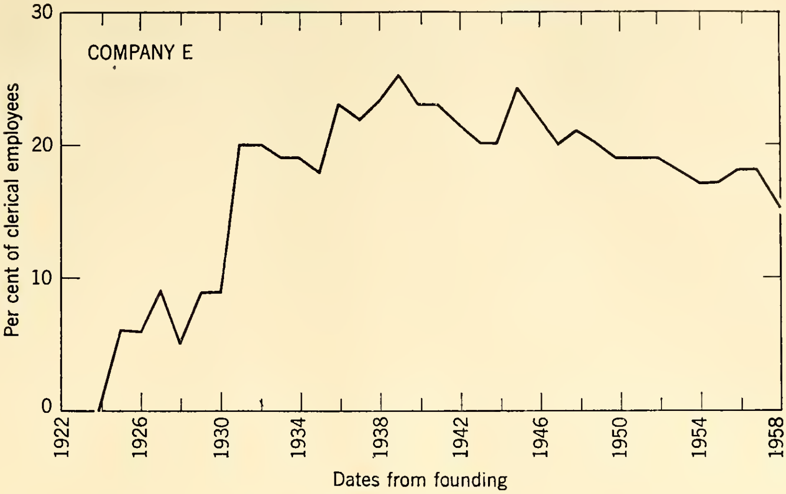


Figure 23

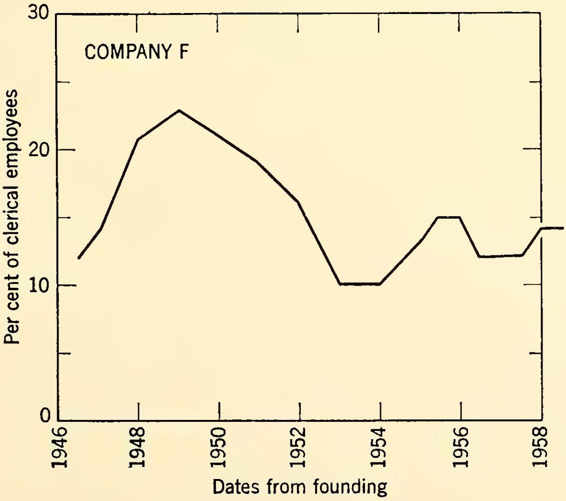


Figure 24

system, a signal barely moves along the membrane at a centimeter an hour; in the sponge it is already up to a centimeter a minute. A differentiated communication system—a nervous system—greatly improves the situation. In a jellyfish a signal goes 10 cm/sec—in a worm about ten times as fast. The arthropods step up the rate by another factor of ten, and finally the anthropods—including man—again show a tenfold increase to something like 100 m/sec. Two things might be noticed—one, that in larger and more complex organisms there is a marked increase in transmissive capacity and hence in adaptive response; and two, in very complex organisms two specialized branches develop—one for internal adjustments (the autonomic nervous system), and one for handling external information (Redfield, 1942).

In social organisms we cannot do much to speed the actual transmission of the nerve impulse, but we can and do develop, like the biological model, separate specialized functions for internal and external adjustments. Instead of increasing the actual transmission speed, there is one thing which we can do. It is a truism in communication engineering that it is always possible to trade band-width for time. If a message takes a channel of x frequencies to travel in y time, one can usually use $2x$ frequencies, and, by simultaneous transmission, achieve $\frac{1}{2}y$ time. This is essentially what happens in the combined staff-clerical function. Unable to speed up transmission, we duplicate messages and transmit simultaneously, achieving a measure of the desired speed.

It seems worthwhile going into this point in a little detail to show the communication role of the staff-clerical function. The first reason is somewhat immediate and practical, while the second is more basic. With the great deal of attention currently paid to the rise of the staff, it will perhaps make us happier with it if we realize its true role. The tendency to refer to staff as "non-productive workers," "overhead personnel," or "burden personnel" expresses a frustration that is quite common, but it represents a bookkeeping fiction more than it does a factual reflection of the true organizational role of the function.

The second reason for considering the issue lies in the organizational problem itself. As the organization grows, the force that seems likeliest to destroy it is the centrifugal force arising from the fact that the members are individuals and tend to fly off on tangents toward their own goals. It seems strange to me that the function of holding the organization together is not more heavily weighted in job descriptions of executives. Usually we read that they collect information, make decisions, see that the decisions are carried out, and the like. Observing executive behavior, it seems to me that most time and effort is spent in holding the thing together as a single working unit. Most organizations, properly started, will largely direct themselves except for periodic, crucial decisions. In terms of importance, decisions catch our eye. In terms of time and effort, and perhaps of equal importance, the holding-together has slipped by us.

In speaking of the reason small firms survive in spite of the advantages of large-scale production, N. S. Ross (1952–1953) finds the answer in the pressure on the executive's coordination. Coordination must be the act of a single center, he reasons, and cannot be delegated. Thus, an increase in size increases the chain of command, and hence the costs of coordinating eventually exceed the declining economies flowing from large-scale production. The histories of the growth of these firms seen both to agree and disagree with Ross. Certainly the cost of coordinating does increase (as shown by the increase in staff not only in absolute terms, but at a faster rate), but, while it may be impossible to delegate coordination, the very phenomenon of growth in the staff-clerical function seems to show that a great deal of support can be supplied to ease the job of coordination and integration. Whether the curve of costs is steeper than that of savings, seems to be a point for empirical determination. Indeed, a rough empirical test exists in the firms studied here, and in many others which have grown much larger.

In view of the central importance of this centrifugal force tending to destroy the organization, it is a wonder we don't have more empirical studies of the engineering structure needed to resist it. These studies show the rapid growth of staff as size increases. A few others offer leads. The basic studies of cohesion in groups offer promise, but at the moment they seem largely confined to the laboratory and are a little removed from the industrial problem. In industry itself, Sune Carlson, studying how Swedish executives spend their time, contributes a point (Carlson, 1951). Asked to indicate what they did, executives reported that about ten percent of their time was spent making decisions and giving orders. More than fifty percent was spent on "getting information" and "advising and explaining." Within these last two categories there may be a good deal of the function of holding the organization together. Unfortunately, Carlson's data do not show the behaviors as a function of size. Other studies could easily test the hypothesis that a larger and larger part of executive behavior falls in this integrative function as size increases.

Another type of study is that illustrated by Weiss and Jacobson's sociometric analysis of a plant (Weiss and Jacobson, 1955). They identified liaison people who were holding the groups together. Of a population of about two hundred, eighteen percent were identified as having this function. Again, this study does not make it possible to study the holding-together as a function of size, but it does show the phenomenon and indicates that the growth study is operationally possible. The informal liaison people make an especially interesting study, since they differ from the recognized staff. The staff is established as a result of a conscious decision to support the integrative function. The liaison individual, on the other hand, is an example of the spontaneous homeostatic economy of the social organism strengthening its structure in the face of disintegrative pressures. The two—the deliberate and the spontaneous—may vary inversely, compensating for one another in terms of the organism's protection, but with very different implications for managerial control.

Summary and Conclusion

We began by looking at a biological model for organizational growth, and went on to look for some things that might flow from it. We spoke of lawful processes in growth, their grounding in forces internal to the organization, the relation of the organization to the environment, and the interdependence of size, shape, and function. Let us look back briefly and see what has come out.

Some suggestion of lawful processes appears in the descriptions possible of the growth of firms. Their total growth can be described by relatively simple growth-equations of a kind useful in population studies and other disciplines. The simplicity and regularity of the process lends support to the idea that the growth is lawful and that it is fruitful to search for general principles. The fact that it is possible to describe growth with only a two-factor equation means that we may search for rational bases for the factors. It is clearly possible to describe any function with enough variables in the equation. The gain here seems to lie in describing a superficially complex process with rather simple parameters.

The regularity of the inside-outside functions also suggests lawfulness and a reasonable prospect of understanding the process. It also provides a lead to the geometry of the space within which the organization exists, just as the growth curves tie its growth to the ecological equilibrium between the organization and its environment. It is suggested that the geometry is capable of study with concepts and techniques presently available.

The changes within a firm during growth showed a variety of facets. In early years, the staff grew rapidly and reached a stable level. In time, the clerical function grew, too, though not as fast as the staff as a whole. It is suggested here that the physical model provides a useful clue to organizational growth. A brace is strongest where the force tending to destroy the structure is strongest. As organizations grow, the bracing material will grow where the destructive forces are focused. The staff growth suggests that this is in the areas of coordination and control. In addition to this, the centrifugal tendency of individuals in organizations is suggested as one of the main forces influencing shape as size changes. A framework for describing growth of staff and line in terms of a module of an individual's contribution is suggested.

These few paragraphs sum up, in a sense, the material which is reported here. It would not be proper, however, to fail to emphasize one further point. This material is based on two widely different things, and two things notably lacking in organization theory: conceptual frameworks broadly based in the logic of science in general; and empirical data painstakingly collected from actual growth. Much of the writing in the field consists of anecdotal, descriptive generalizations which fall midway between the two. They are neither based on careful, empirical research nor related to a general, theoretical framework. The present trends in the field are away from this tradition, and it seems likely that the eventual understanding of the organization of industrial operations will flow only from these new approaches.

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JACOB MARSCHAK

11.

Efficient and Viable[1] *Organizational Forms*

IF SEVERAL PERSONS AGREE TO FOLLOW A CERTAIN SET OF RULES, WE shall say—just for the purpose of this paper and without quarreling with other existing definitions—that they are members of an *organization.* We shall call this set of rules the *organizational* form or *constitution.*

The rules that the members are supposed to obey deal with their actions, mutual communications, and observations. Typically such a rule (also called "role" by sociologists, I believe) states what a given member *should do* when he receives *information.*

[1] *Viability* stems from French *vie* not from Latin *via:* see Webster.

A draft version of the paper, prepared under a contract of the Office of Naval Research with the Cowles Foundation for Research in Economics at Yale University, was presented at a Symposium of the Research Committee on Organization Planning of the American Institute of Industrial Engineers, New York, March, 1958. The paper was expanded and completed when the author was visiting research professor at the Carnegie Institute of Technology, 1958–1959.

Doing means here either:

1. impinging on the world outside of the group of people forming the organization; we call this *action;* or
2. sending to or receiving a message from another member; we call this *internal communication* (and for brevity often omit the word "internal"); or
3. receiving messages from the outside world; we call this *observation.*

For example, an action may consist in adding fuel to a heater, in driving a truck, or in writing to a client. A communication may consist in giving an order to a subordinate, a report to the boss, a speech at the board meeting. An observation may consist in reading a newspaper, a client's letter, the report of a market-research agency.

It is convenient to extend the term "communication with another member" to "communication with one's own memory": committing a received message to one's memory ("filing"), or digging out past information. A cross section of what is being done within an organization during a given period of time is schematically represented by a matrix (Table 1) which may clarify the logic of our concepts.

Table 1

A Matrix of Actions, Observations, and Internal Communications

Receiver

		0	1	2	. . .
	0	(0, 0)	(0, 1)	(0, 2)	
Sender	1	(1, 0)	(1, 1)	(1, 2)	
	2	(2, 0)	(2, 1)	(2, 2)	
	. . .				

The cell (1, 2) would be filled with the description of messages sent by member 1 to member 2; the cell (2, 1) would contain messages in the opposite direction. The row and the column marked "zero" represent the outside world; hence the observations being made by member 1 would be entered in the cell (0, 1), and the actions of member 1 (interpreted as "messages to the outside world") would be entered in

(1, 0). Each diagonal cell—(1, 1), (2, 2) . . . —is filled with communications between a member and his memory; with the exception of the cell (0, 0), which naturally summarizes all those external events that do not impinge upon, nor in any way reflect, the organization's doings.

In general, an organization member acts or communicates or observes in a given period of time in response to some "message" that he has received from the outside world or from a member (possibly himself), in the preceding period(s). As we have indicated at the beginning, the organizational form consists of rules that prescribe "who should do what in response to what information?" Schematically, the rules state that if the cells of the matrix in Table 1 had certain contents during a given week, they should be filled in a certain fashion in the next week.

The workings of an organization might be better understood if, instead of the usual "organizational chart," one could have the description—if only very rough—of "who does what in response to what information?"

A description of the rules of action and communication that are in actual use in a given organization (though possibly not the officially proclaimed ones) would also help to *improve* them. The set of rules can be good, less good, bad. One set of rules is better—or *more efficient*—than another if, *on the average*, it is more conducive to achieving certain *goals*.

Let us discuss in more detail this evaluation of rules—and hence of organization forms—according to their efficiency. As so often, it helps to begin with a simple, limiting case: the one-man organization, the rules for a single decision-maker. They prescribe what he shall do in response to a given information. One rule is more efficient than another if, *on the average*, it is more likely to further the decision-maker's goals.

I have just said "*on the average*" because the outcome of a person's doings depends, of course, on the chance events of the outside world, and not only on his manner of acting. No soldier or farmer claims the gift of prophecy. Every businessman knows that business involves gambling. He acts on the basis of more-or-less well-founded ideas of how likely it is that the demand for his product will rise or fall; or how likely an invention is to succeed or to fail; and so on. In short, he acts on the basis of some approximate knowledge of, or some hunches about, the probabilities of possible events. More or less consciously he estimates, in effect, the *probability* with which a given decision of his will lead to one result rather than to another.

The decision-maker cannot control the external events, such as the public's demand in a widely competitive market, or the government policies that lead to inflation or deflation; he can only estimate the probabilities of such events. But he can control his own decisions. He chooses, from among several decisions open to him, that decision which—measured on his goals—leads, on the average, to better (or, at least, not worse) results than other possible decisions. One calls such decisions good, or more technically, *optimal*, decisions (avoiding the term "best decision," since two decisions may be equally good); or *efficient* decisions. We shall use *decision* and *action* interchangeably.)

The description just given presupposes the simple, but rather exceptional case of "*one-shot decisions*": the case when no consideration is given to the fact that today's decision may affect the outcome of tomorrow's decision. Yet little thought suffices to extend the concept of efficient decisions also to the more interesting, more usual, and more general case when the phrase "sufficient unto the day is the evil thereof" is not valid. In this more general case one makes "decisions about future decisions," one chooses "maxims of behavior," also called "sequential decisions," strategies, or, in our terminology, *decision rules.* Faced with an unknown sequence of future events, the decision-maker chooses not only what to do today, but also (more or less roughly) how to respond to each of the various possible events of tomorrow and of the day after, and of a still later day. In this choice he is guided by some (more-or-less vague, more-or-less conscious) estimates of probabilities; so that, again, an efficient decision rule is one that, on the average, produces good results, in terms of the decision-maker's goals.

Clearly this is an idealized picture, a *norm,* a piece of logic not of psychology. To prefer efficiency to inefficiency is itself a norm. Is it therefore a useless exercise? I don't think so. Psychologists tell us how often, and by what kind of people, certain logical—or, for that matter, arithmetical—errors are made; this does not make arithmetic and logic useless. In fact, we do try to teach children arithmetic. We are concerned when our students lack logic. And, I suppose, teachers of Business or of Miliary Art are rather anxious to inculcate the ability of efficient decision.

Our picture of efficient decision-making is unpsychological in another important way; it is not true that a man has consistent goals, or values (on which to measure efficiency). It is an idealization to say that a businessman (as such) tries to make, on the average, a large profit, and that the military man tries to act so as to make victory as probable as possible. Again, I believe this idealization is not useless (measured on the goals of those who try to improve the workings of businessmen or of generals).

We now return to the general case, the several-man organization. The extension to this case of the concept of decision rules just defined for the special case, the one-man organization, is obvious: the "rule" is replaced by a "set of rules" (one for each member); and the concept of internal communication is widened to the scope given it at the very beginning of the paper. It is the concept of the *goals* (or values) that seems to present difficulties. If, psychologically, even a single man may lack consistency of values, what to say of a group of several?

Nonetheless, it is possible to evaluate the efficiency of an organizational form, for a *given* goal. A business concern may be inefficient in profit-making but efficient in making its executives love each other. Once the goal is stated, the same logical tools apply. If the goal is defined by an "aspiration level" we can say that the decision's outcome has two values: 0 if "failure" (below the aspiration level); 1 if "success" (above the aspiration level); and the *average* value of the outcome = (1 × Probability of success) + (0 × Probability of failure) = Probability of success.

One empirically useful approach is to estimate the efficiency of an organizational form by taking as the goal a high *chance of survival.* A census of existing organizational forms in some centuries-old field (e.g., that of religious organizations, or of small handicraft, or of family farming), may confirm that certain rules of action and communication, in this particular field, are more viable than others; they have, in the anthropologists' language, a higher "survival value." Such empirical confirmation on evolutionary grounds is, however, true only if one has the right to assume that the environment (that is, the probability distribution of the relevant external conditions) has not changed significantly in the course of time.

Whether the investigator chooses viability or some other goal as the criterion to compare the efficiency of organizational forms in a given field of activity, this goal need not coincide with the goals of any of the members of the organization. Such coincidence is improbable, if only because the individual goals are, in general, not identical among themselves.

This independence of the organizational goal (as chosen by the investigator) from the individual goals does not, by any means, make the efficiency judgments meaningless. It is certainly possible to judge the efficiency of a business corporation in terms, say, of its aggregate profits over the next two generations, without postulating this to be the goal of any of the executives or stockholders. Nor does the frequent praise of the efficiency of the Roman Catholic Church necessarily imply that it has served well the individual aims of all its popes, bishops, and laity.

This raises the problem of *incentives.* Organization rules can be devised in such a way that, if every member pursues his own goal, the goal of the organization is served. This is exemplified in practice by bonuses to executives and the promise of loot to besieging soldiers; and in theory, by the (idealized) model of the *laissez-faire* economy. And there exist, of course, also negative incentives (punishments).

I shall have to leave the problem of incentives aside. In what follows, we shall not be concerned with individual goals. If they still lurk in your mind, inhibiting our understanding of each other, you may make the assumption (actually unnecessary for what follows) that the members of the business organization I am going to discuss are partners sharing the profits equally, or that some perfect system of incentives is operating. In short, you may think of a *team.* My main purpose is to illustrate how various organizational forms can be compared, and an optimal one chosen, given a goal.

Suppose a shipbuilding firm has *two docks:* an old one and a new, mechanized one. The former has higher operational costs (mainly labor) and the difference depends on the dockworkers' wage rates, assumed to be the same in both docks. Suppose further the firm has *two sales representatives,* each in a different market. We shall call the two markets East and West. Each representative receives *price* offers (orders for ships) in his market: this is his piece of information. The production manager on the other hand, knows the current wage rate and hence the production *costs.* Suppose the operational costs per ship are

in the new dock: 20
in the old dock: 35

(we neglect capital charges and other non-operational, fixed costs as they must be paid in any case and therefore cannot affect the choice of a decision). Suppose the *prices* offered by a client to a salesman are

in the East: 29
in the West: 21.

Clearly if the production manager and the two sales representatives sit in conference they will take the following decision as the best one: use the new dock for the Eastern client (making a profit of $29 - 20 = 9$), reject the Western offer, leave the old dock idle. Instead of having a conference, they might also reach this same decision by each salesman's first reporting the local price to the production manager and then receiving from him the instruction to accept or reject the offer.

But conferences and other forms of extensive *communications take time and money*, especially in the form of salaries to busy executives. We ask therefore: Is it always best to "centralize" all decisions, i.e., base them on *all available information* collected at some conference or headquarters? Under what circumstances is such centralization justified? When is it, on the contrary, more economical to let the local, or the specialized, persons go ahead on the basis of their own *limited information* even if this may involve occasional risks? And what should this limited information be? Should, in our example, a sales representative be constantly informed of the fluctuations in production cost, though not of the fluctuations in markets other than his own? Or could one leave him without even the cost information? Furthermore, each type of information can be used in a variety of ways, applying different *rules of action.* For example, if each salesman knows the production costs in both docks and has the power to accept or reject offers in ignorance of prices in markets other than his own, at what prices should he accept offers, so as to minimize the risk of forcing the firm into the use of the old dock at too small a profit or even at a loss?

In spite of its artificial simplicity, our example may throw light on a fairly large class of practical problems. These arise whenever several decision-makers share the same limited facilities, and the unit cost to the firm increases with output. Instead of two docks, one might think of several plants; or one can replace the "new dock" by "operations during the normal working day of the wage earners," and the "old dock" by "overtime work at extra pay." Also, instead of "local prices" one might think, for products like bread, of "expected local demand" (as with the sales organization of bakeries, a problem that has been studied by C. B. McGuire[2] at the Cowles Foundation, Yale University, and that has in part suggested the example I use here). Thus, many aspects of our "shipyard" example carry over into other fields.[3]

To return to our problem: We want to find, for each system of communications, an optimal set of rules of action for the sales representatives, i.e., that set of rules of action which results in the highest average profit attainable with this communication system. We may call this the *maximum average gross profit.* Deducting the average communication cost (i.e., mainly the executives' salaries chargeable to communications) necessary to maintain and operate the particular communication system, one obtains the *maximum average net profit* of the organizational form that is characterized by the communication system.

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[2] Mr. McGuire has also helped to revise the final version of this paper.

[3] In collaboration with Roy Radner, now at the University of California, the author has attempted to classify various models of teams on the basis of their mathematical properties. Such models are relevant to many aspects of business, such as production, promotion of sales, speculation, etc. A book on the economic theory of teams is being prepared. See also the author's "Elements for a Theory of Teams" in *Management Science,* 1, No. 2 (January, 1955); and "Towards an Economic Theory of Organization and Information" in *Decision Processes* (Thrall, Coombs, and Davis, eds.), Wiley, New York, 1954.

If, for example, the average profit of a "centralized" decision system is only slightly higher than that of some "decentralized" system (assuming that appropriate optimal rules of action are used in each case), then the centralized system will have to be rejected, unless the added communication costs that it requires are also slight.

To illustrate, assume that the operational costs in the two docks (20 and 35, respectively) are constant; it is only the prices offered that vary. To figure out in advance the best rules of action, one needs to have an idea of the likely price situations. For simplicity, assume that the prices in the two markets obey the law of chance of Table 2.

Table 2

Probability Distribution of Prices Offered in Two Markets

		East		
		High (= 39)	Low (= 21)	Total probability
West	High (= 31)	.4	.1	.5
	Low (= 29)	.1	.4	.5
	Total probability	.5	.5	1.0

	Average price	Price spread
East	30	18
West	30	2

Correlation coefficient = .6

That is, with probability .4 both prices are high; with probability .4 they are both low; with probability .1 the Eastern price is high and the Western low; finally, with probability .1 the price is high in the West and low in the East. (Thus markets are supposed to be more likely to move in the same than in opposite directions.) We have further supposed that while the average price is the same (= 30) in both markets, the Eastern price jumps more violently: from the "low" of 21 to the "high" of 39; whereas the Western "low" is 29 and its "high" is 31 (no intermediate prices in any market; this simplifies the arithmetic).

Under the centralized system the head office will clearly choose the following rule as optimal: a ship will be built in the new dock, for the Eastern client if his price is high, for the Western client if the Eastern price is low; the old dock will lie idle (at least as long as the assumed costs remain unchanged). This rule and the resulting profits are shown thus:

Table 3

Optimal Decision Rule in a Centralized Firm

Prices: East	West	Offer Accepted	Profit	Probability
39	31	East	39 − 20 = 19	.4
39	29	East	39 − 20 = 19	.1
21	31	West	31 − 20 = 11	.1
21	29	West	29 − 20 = 9	.4

Average Profit: 14.2

The average profit = (19)(.4) + (19)(.1) + (11)(.1) + (9)(.4) = 14.2. It is easy to see that any other rule, under a centralized system, will yield a lower average profit.

Now, assuming the same cost and price conditions, consider the following form of a "*decentralized*" system: each sales representative accepts or rejects local offers in ignorance of the price in the other market. Clearly there are four possible rules for each sales representative: (1) accept only if the price offered to you is high; (2) accept only if that price is low (a paradoxical yet reasonable rule, as we shall see!); (3) accept at either price; (4) never accept—i.e., go fishing. Hence there are 4 × 4 = 16 possible pairs of rules for the pair of salesmen. For each pair of rules one can compute, as before, the average profit.

It may seem a *paradox*, but the following pair of rules turns out to be optimal: the Eastern salesman should accept offers at the high price only; but the Westerner should accept offers *at the low price only.*

With these rules, the average profit is (19)(.4) + (13)(.1) + (0)(.1) + (9)(.4) = 12.5, computed as follows:

Table 4

Optimal Decision Rule in a Decentralized Firm

Prices: East	West	Offer Accepted	Profit	Probability
39	31	East	39 − 20 = 19	.4
39	29	East and West	39 + 29 − 35 − 20 = 13	.1
21	31	None	0	.1
21	29	West	29 − 20 = 9	.4

Average Profit: 12.5

Similar computations show that the next-best pair of rules is for the Easterner to accept at high prices only and for the Westerner to accept in any case (average profit = 12). The rule that ranks third (with average profit = 10) is: either the East or the West agency should close shop, the other should accept an offer at any price. The ranking of such rules would turn out to be a different one if I had not purposely chosen numbers that lead to a "paradox"—i.e., to a correct solution that may not seem right at first sight. It serves to illustrate the need for some formal thinking and reckoning. The solution becomes plausible if you remember that under our assumption a low Western price of 29 is likely (with odds as high as 4:1) to be accompanied by a still lower Eastern price of 21; while a high Western price of 31 is likely (with high odds again) to be accompanied by a still higher Eastern price of 39. This justifies, on the average, the Westerner's acceptance of a low-price offer to insure that the efficient dock will be used, and his rejection of a high-price offer to diminish the risk of forcing the firm into using the second, inefficient dock at a loss.

We thus find that the "decentralized" system (as defined) yields, under the best rules, an average profit that is 1.7 (= 14.2 — 12.5) below the highest average profit attainable under the "centralized" system. Therefore, if the additional *communication* cost implied in the centralized system exceeds 1.7, we shall reject it; if it is less than 1.7, we accept centralization.

The answer to every problem depends on the "givens" of the problem. In every team problem, the "givens" are: (1) the "*payoff func-*

tion," i.e., the formula that shows how profit depends on the decisions (in our case the decisions to accept or reject an offer) and on the external states (in our case the two prices) as shown, for example, in the "profit" column of my two tables; (2) the *probability function* which states the probabilities with which the various possible external states are likely to occur; and (3) the *organization cost function* which attaches a cost to each of the organizational forms under consideration.

With regard to the *payoff function,* one can say, in general, that more communication is justified when the payoff function involves *"complementarity"* between the members' actions, in the following sense: the effect of one member's action depends on what his colleague is doing. This was certainly so in our example, because of the high production cost in the old dock. If the two docks were equally efficient the need for communication and, hence, the advantage of centralization would be smaller. There is a high complementarity, and therefore strong need for communication, among the stationmasters of a railroad; but, I presume, little complementarity between the branch managers of Sears Roebuck.

Another property of the payoff function which, if present, calls for communication is the existence of *"multiple optima."* It is equally good for all to drive on the right side of the road, or for all to drive on the left side (as they do in England); but someone has to play the role of a *coordinator.* Time-schedules for group work are often of the same nature; we needed an organizer to have all participants of this symposium to come to this place at this time, although some other place and time might be equally good.

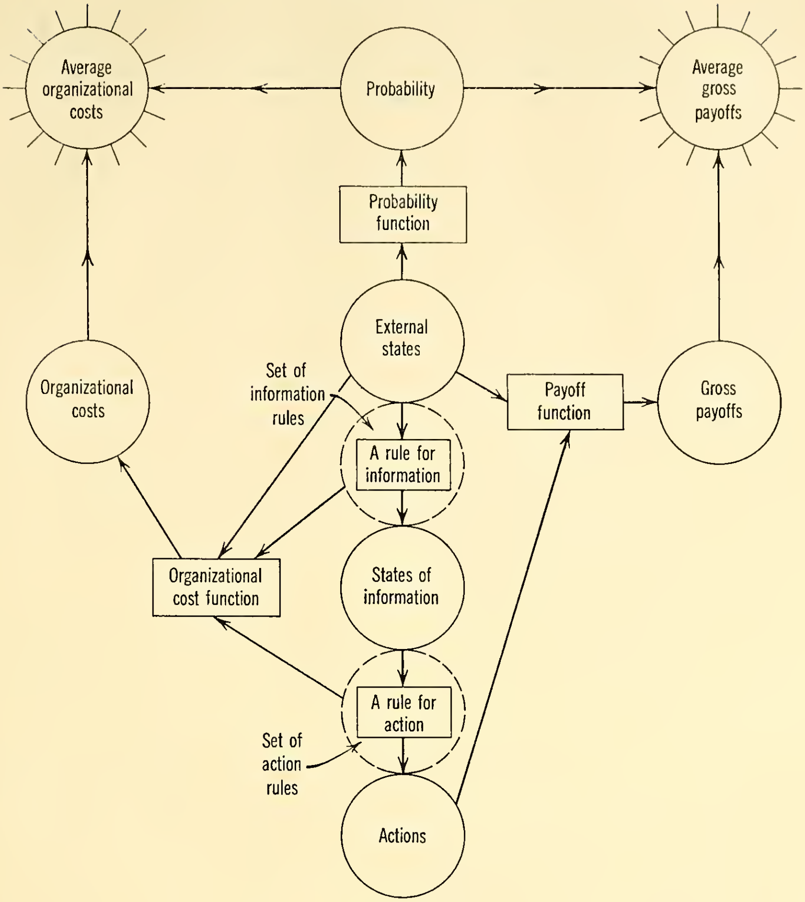
In our case, I had mentioned a pair of rules of action under which one of the two salesmen—*regardless of which*—should accept all offers (at least as long as production costs remained as they were), while the other should not accept any. This pair of rules ranked third, but it would become an optimal one under different numerical assumptions. But then there would be actually two pairs of rules to choose between: either the Westerner or the Easterner should be the one always to accept offers. Thus a coordinator is needed because there are two equally good solutions.

We have also seen how the *probability distribution* of non-controlled events (prices, in our case) affects the solution. Our "paradoxical" solution was due to a high correlation between the two prices and to the fact that one of them had a higher spread or variance than the other. Common sense can add a few more guesses about the way in which the nature of the probability distribution affects the choice between various forms of communication. I am willing to pay a lot for information on future prices of stocks, not of bonds; for the higher the *variability* of a thing, the more useful it is to learn about its state. Further, I am not willing to pay much for special information about the price of a stock, if it is strongly *correlated* with some other price which I know anyhow.

To obtain other useful theorems about the way in which the payoff function and the probability distribution may affect the ranking of various organizational forms, one has to dig deeper, gathering factual knowledge about live organizations (see my earlier remarks on the deficiency of mere "organization charts") and interpreting it logically and mathematically.

One important gap has to be closed: our ignorance of the *communication costs.* We need measurements of the executives' efficiency in using their time—a subject on which, I think, psychologists are working. What we need is something corresponding to, but more appropriate than the I.Q. We need a special "E.Q." (executive quotient). The I.Q. scale is essentially nothing but the statistical distribution of a large sample of American children with respect to their performance of certain tasks. For example, "I.Q. = 100" is a set of tasks that fifty percent of all children can perform (the "median" performance). We need, similarly, a statistical distribution of American executive abilities, as measured by performance truly relevant to efficient communication and decision-making.

On Figure 1, the three *given* functions—the probability function, the payoff function, and the organizational cost function—are represented by boxes: they are "operators" transforming "inputs" into "outputs" as indicated by arrows. These three functions, or operators, are *given;* that is, they are not controlled by the organizer. But two other operators (boxes)—the information rule and the action rule—are *chosen* by him, rather than given to him; the investigator can compare them with other rules for greater or smaller efficiency. Each input or output is an element of some set, represented by a circle. For example, a particular "external state" is operated upon in three places: first, together with a particular "action" it determines the particular gross payoff, depending on the payoff function; second, the external state has its probability depending on the given probability function; third, depending on the chosen information rule, the external state will result in a given state of information. The information rule and the action rule can be chosen each out of a set of such rules—represented by dotted circles (thus the two boxes drawn are typical only of other elements of the sets of possible rules of action and information). The two rules are chosen so as to make the *net average*


Average organizational costs
Probability
Average gross payoffs
Probability function
External states
Set of information rules
Organizational costs
A rule for information
Payoff function
Gross payoffs
Organizational cost function
States of information
A rule for action
Set of action rules
Actions

Circles are sets (variables)

Boxes are operators (functions)

Dotted circles ◌ are sets of *controlled* operators which can be chosen so as to maximize the *net* expected payoff, i.e., the difference between elements of radiant circles ☼

Figure 1. Determination of average gross payoff and average organizational costs.

payoff as high as possible; it is the difference between *average gross payoff* and *average organization cost;* the circles representing these two variables (sets) are distinguished by an aura to emphasize that they are "goal" variables, in the light of which the efficiency of rules is judged.

There is no need here to expand on the differences between a "model" and the "reality," and on the usefulness of models for both understanding and improving practical solutions. My "shipyard" model is easily made more realistic and more complicated. Its solutions would then transgress simple arithmetic, needed for a presentation like this one, and call for more powerful mathematics and machines. (In fact, the "bakery" problem mentioned above turns out to be one in linear programming.)[4] Even then, the main service one can expect from organization models is to clarify the general logical lines of a practical problem. This clears the ground for the more subtle aspects of the practical problem that escape formalization and call for so-called intuition judgment. Even the best biochemist will not replace a good restaurant chef. Yet biochemical analysis has, in fact, improved our food.

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[4] For a different problem, see Roy Radner, "The Application of Linear Programming to Team Decision Problems," *Management Science,* **5,** No. 2 (January, 1959).

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